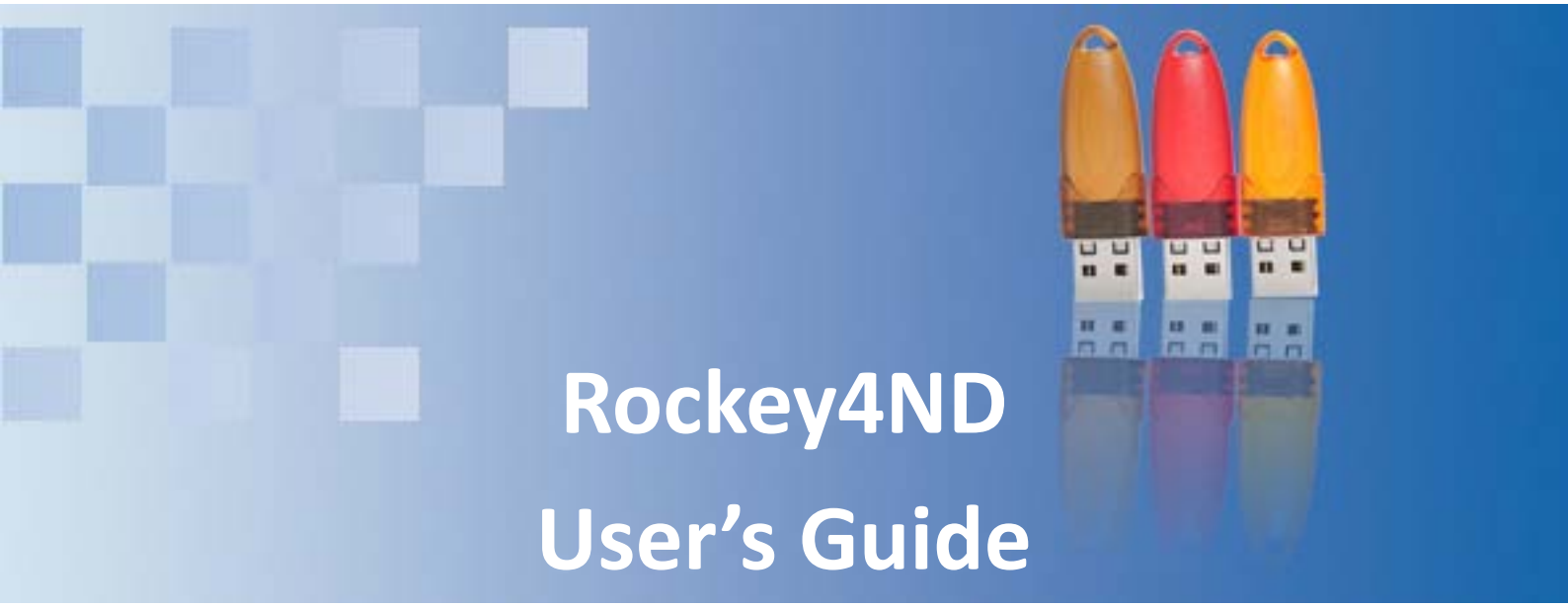
FEITIAN



Rockey4ND User's Guide

V1.1

Feitian Technologies Co., Ltd.

Website: www.FTsafe.com

Revision History:

Date	Revision	Description

Software Developer's Agreement

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Quick Start

■ The ROCKEY4ND evaluation kit is provided to developers for trial purpose. It includes the product package, documentation, CD-ROM, extension cable, and dongle. The dongle is the same as the formal dongle, except that the access password for it is public (P1: C44C, P2: C8F8, P3: 0799, P4: C43B). If customers want to purchase the product after evaluation, a dongle with a unique password will be provided for security consideration.

■ To install ROCKEY4ND SDK, run Setup.exe in the kit, with which you can finish the installation of the SDK through a wizard. For details, see Chapter 3 ROCKEY4ND SDK.

■ You can find the dongle editor Rockey4ND_Editor.exe under *Editor* directory in *Utilities* directory of the SDK. You can modify, test, or write to the dongle using this tool. For details, see Chapter 5 ROCKEY4ND Editor.

■ An envelope encryption tool Envelope.exe is also provided under *Envelope* directory of the SDK. You can encrypt Windows PE files, .Net files, and data files using this tool, simply by clicking on the target file and related functions. For details, see Chapter 6 ROCKEY4ND Envelope Encryption.

■ By incorporating the ROCKEY4ND API into your applications to be protected, you can get the most out of the dongle with the highest level of security. For details, see Chapter 7 ROCKEY4ND APIs.

■ You can find some frequently asked questions and the answers in Chapter 9.

■ For updates and any other things you are interested in, visit us at http://www.FTsafe.com.

Contents

Chapter 1. Introduction

1.1 About ROCKEY4ND

ROCKEY4ND is an advanced software protection system that attaches to the USB port of a computer. Your software may be duplicated, but it will only run when your ROCKEY4ND "dongle" is attached to the computer. It can also limit the use of your software. Your application will interact with ROCKEY4ND at start-up and during runtime. If the dongle has been removed, or if an application module has been accessed a preset number of times, it can issue an error message and terminate, or take other alternative actions to ensure compliance with your licensing agreement. ROCKEY4ND is versatile and can be applied to other scenarios as required.

Unlike some competing products, ROCKEY4ND is a powerful miniature computer, with a CPU, memory and specialized firmware built-in that allows for a robust interaction with your application. You may write complex algorithms that are securely stored in the dongle, and then call those algorithms from time-to-time in your application. This method for software protection is strongly recommended and is very difficult to crack, and although ROCKEY4ND was designed to implement extremely high levels of security - it is also relatively easy to implement. The ROCKEY4ND API set has been simplified and improved based on experience gained from earlier versions.

The ROCKEY4ND product also includes an Envelope encryption tool - Envelope.exe for encrypting Windows Portable Executable files (such as .dll, .exe and .arx), .Net file, and data files. It is very easy to use. Only a few seconds will be taken to encrypt a file. The ROCKEY4ND Envelope tool is an ideal solution if you do not possess the source code for your application, or are unfamiliar with implementing an API. A security system that combines both the API set and the Envelope program will offer the greatest level of protection.

There are several components to the ROCKEY4ND software security solution and each of them will be discussed in this document. The following is an overview of the ROCKEY4ND components, along with a reference to where they will be discussed in this document:

- The ROCKEY4ND Envelope program (Envelope.exe) is a fast and convenient means of encrypting .exe, .dll, .arx and other Portable Executable (PE) files. This solution is ideal if you do not have access to source code or you are not familiar with the ROCKEY4ND API set. (See Chapter 6: ROCKEY4ND Envelope Encryption)
- The ROCKEY4ND Editor (Rockey4ND_Editor.exe) is a graphical tool for performing operations on the dongle. The Editor may be used to read data from and write data to the dongle, perform arithmetic operations in the dongle or test the dongle for malfunctions. (See Chapter 5: ROCKEY4ND Editor)
- ROCKEY4ND has an API set that you may use to create flexible and powerful software protection systems. This document provides VC ++ examples and other examples are provided on the CD-ROM under Samples directory. (See Chapter 7: ROCKEY4ND APIs)

1.2 Software Protection Mechanism of ROCKEY4ND

The protected software application must call the ROCKEY4ND dongle during run time, since the application is dependant on the hardware. It is impossible to duplicate the chipset of the ROCKEY4ND hardware, and so too it is impossible to duplicate your software, ensuring your software is protected from piracy.

1.3 Hardware Configuration

User memory is divided into 2 parts. The size of each is 500 bytes. The length of the algorithm area is 128 units. The number of the modules is 64.

1.4 ROCKEY4ND Benefits

1. **Compact Design** – The dongle is compact and portable.
2. **High Speed** -- ROCKEY4ND was designed to process even very complex algorithms with minimal delay for your application. Users will typically notice no degradation in application performance as a result of ROCKY4ND being implemented.
3. **Ease of Use** – ROCKY4ND's reduced API set simplifies the programming effort in implementing API calls within your code, and the Envelope program has also been improved for increased security with the release of ROCKEY4ND. Developers lead time in implementing ROCKEY4ND is vastly reduced, saving both time and costs in deploying security into your software.
4. **High Security Levels** – Redesigned ROCKEY4ND offers a much higher level of security over previous version. ROCKEY4ND implements a two level security system to segregate users who require read only access from those who require administrative privileges. ROCKEY4ND has a built in time gate to prevent software tracking and is powerful enough to support developer defined algorithms that brings software protection to a new level of security.
5. **High Reliability –** FEITIAN employs an advanced customers managing system for ROCKEY4ND. We guarantee that the password of every customer is unique and that the hardware ID of every dongle is also unique. The password
and hardware ID are burnt into the CPU, it is absolutely impossible to change, even for us—the manufacturer.
6. **Broad Support for Operating Systems --** ROCKEY4ND protected applications may run on: Windows 98 SE/ME/2000 /XP/2003; Linux; MAC.
7. **Abundant Programming Language Interfaces** -- ROCKEY4ND provides interfaces for these common development tools: PB, DELPHI, VFP, VB, VC, C++ BUILDER and etc.

1.5 How to Choose a Right Software Protection Solution

The protection level applied to software not only depends on the dongle, but also on how the developer uses the dongle. Even if the dongle is the best in the world, a rudimentary implementation of security with your dongle can render the total security solution weak. ROCKEY4ND dongles offer two protection methods: envelope encryption and API encryption.

You may invoke the program Envelope.exe under Envelope directory of the SDK to perform the envelope encryption function. As the name indicates, envelope encryption adds an envelope to the user's designated files to protect them. The envelope will call the dongle. When users execute the program protected by the envelope,

the protected program will automatically call the ROCKEY4ND and decide whether to allow the program to continue according to the results of the call. The envelope program directly encrypts the compiled files. The advantage of envelope encryption is that it is very easy and quick to implement and the source code does not need to be modified. The envelope method is the ideal choice if there is no time for learning the API method or if the source code is lost or unavailable. The disadvantage is that an envelope program uses a rule based encryption method, and rule based encryption methods are not as strong as methods that use an encryption key. Also, envelope encryption cannot support script languages that cannot be compiled, such as VBA.

For API encryption, developers need to choose the appropriate language interface according to their programming language to access the dongle. API encryption was designed to be flexible; so you can make full use of the encryption functions of ROCKEY4ND. Developers can decide where and how to encrypt their software. API encryption is more secure than envelope encryption and especially so when the internal algorithm function of ROCKEY4ND is utilized. But API encryption must work with the original program and it can take the developer more time to become familiar with the API.

Chapter 2. ROCKEY4ND Hardware Features

2.1 ROCKEY4ND Internal Structure

At the core of ROCKEY4ND is a specialized CPU with a USB interface. It supports the USB 1.0 standard and is compatible with USB 2.0 standard. In addition to the CPU is a non-volatile memory chip that can save your data in the event of a power loss. The ROCKEY4ND functions are divided into User, Module and Algorithm zones. The developer may store important information (such as an application serial number) inside the dongle. You can write to the ROCKEY4ND dongle as many as 100,000 times – there is no appreciable limit on the numbers of reads. The ROCKEY4ND chip supports special functions for random number generation, seed code generation and user defined algorithm interpretation.

2.2 ROCKEY4ND Hardware Interface

ROCKEY4ND USB supports USB Standard 1.1. At the most 16 USB dongles can attach to a computer with a USB extension HUB. The LED of ROCKEY4ND USB indicates the status of the dongle. (In a normal state after the dongle is attached to the computer the LED will be on all the time. If the LED blinks it indicates that the driver is not installed. Other LED responses indicate hardware failure.)

Note: ROCKEY4ND is a plug and play USB device. To unplug a ROCKEY4ND while writing/reading, the dongle may cause crashes to the operating system in some instances.

Chapter 3. Installing ROCKEY4ND SDK

You will find the program *Setup.exe* under the root directory of the CD-ROM included in the Software Developer's Kit (SDK). The contents of the CD-ROM are not zipped. Experienced developers may simply copy all necessary content to the computer.

The content of the CD-ROM consists of two parts: Tools under the directory Tools. Some documents on how to use these tools are provides in the corresponding folder. APIs for different programming languages.

3.1 Installing SDK

Below we will discuss how to install and use the development package.

Step 1.

FEITIAN provides a *Setup.exe* installation wizard program on the CD-ROM. You may select the components you need. The installation of the drivers is also integrated in this wizard. Double click the *setup.exe* file from the root directory of the ROCKEY4ND CD-ROM. You will see the first screen of the Setup Wizard pictured below (Figure 3.1). Select language at the first step.

Figure 3.1

Step 2.

Close other application to avoid the need of rebooting the system.

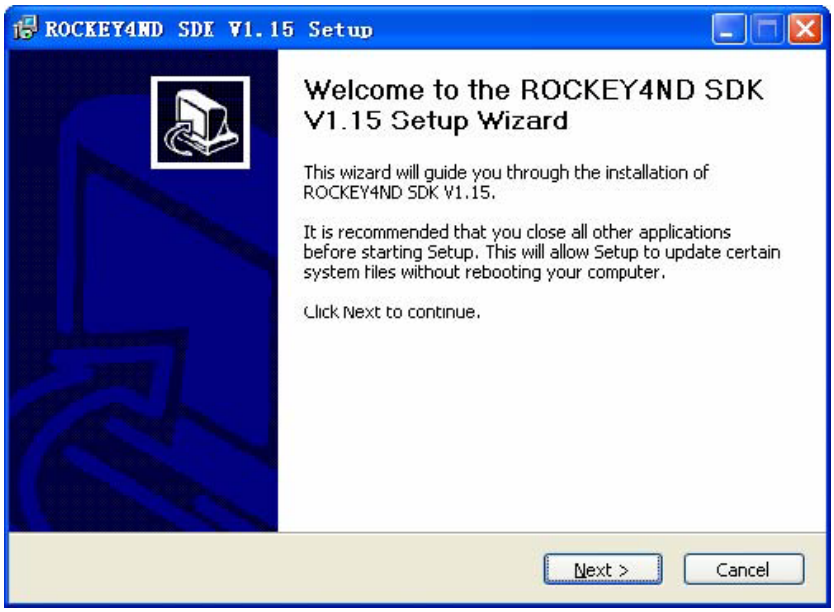

Figure 3.2

Step 3.

View the software release agreement.

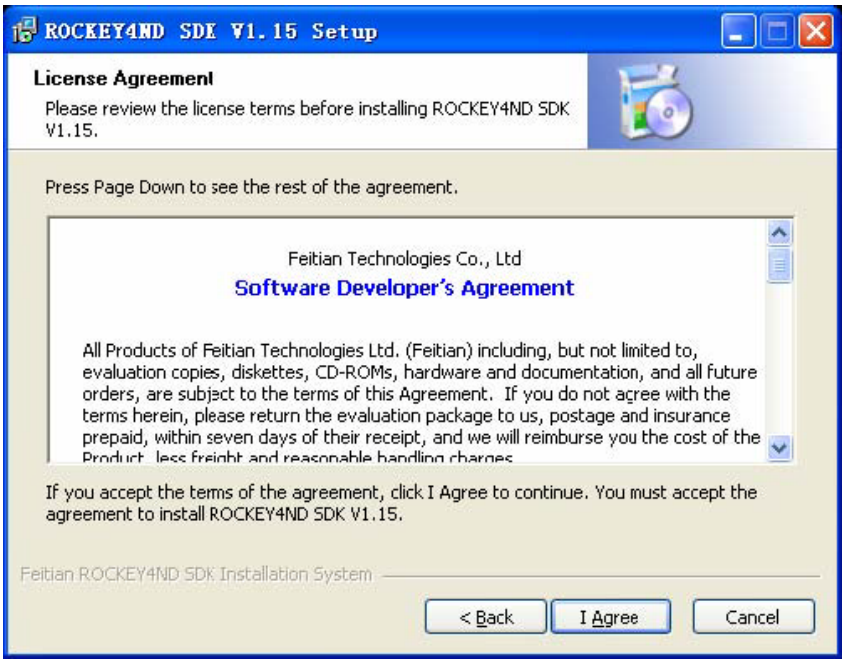

Figure 3.3

Step 4.

Figure 3.4 show the type of installation. Please select the content you want to install.

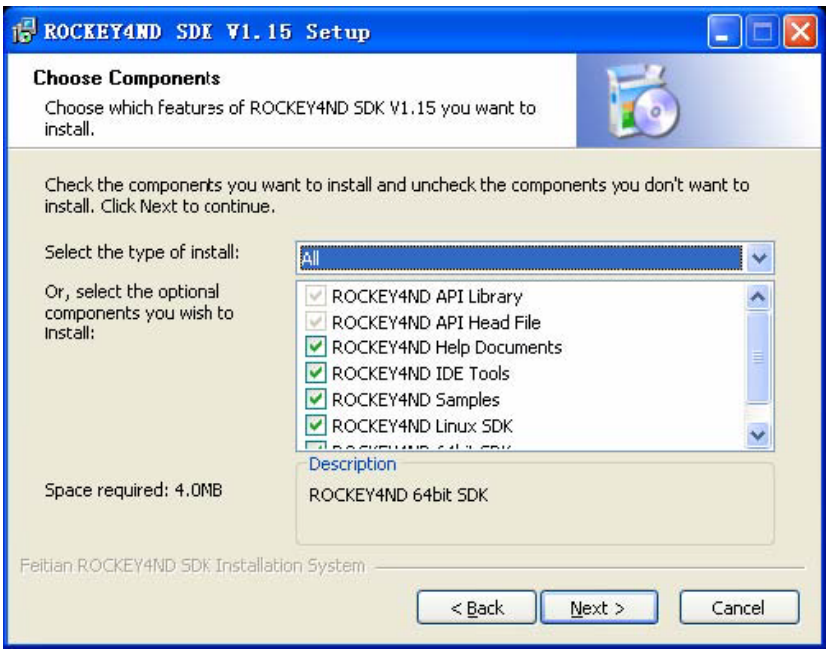

Figure 3.4

Step 5.

Select the path to install the SDK.

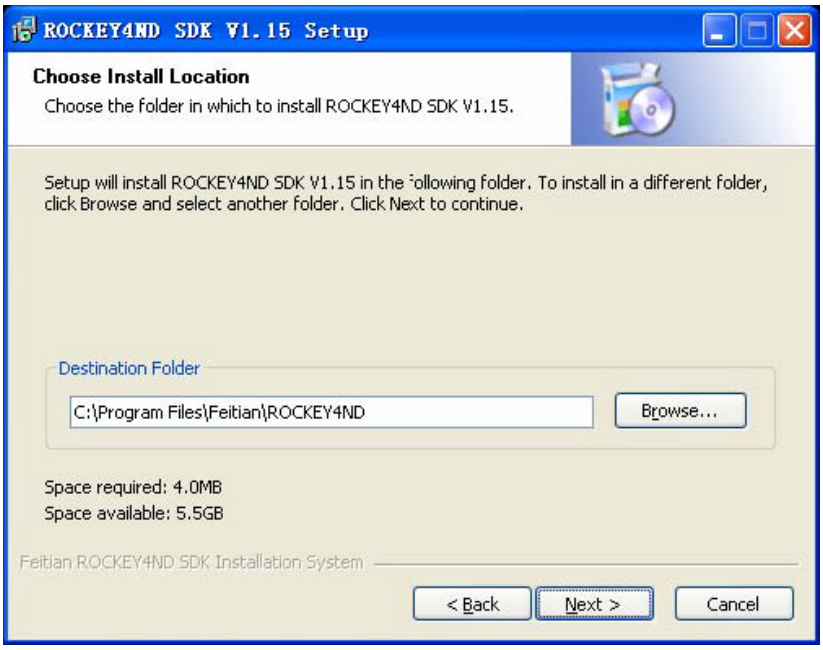

Figure 3.5

Step 6.

Finish installing the SDK.

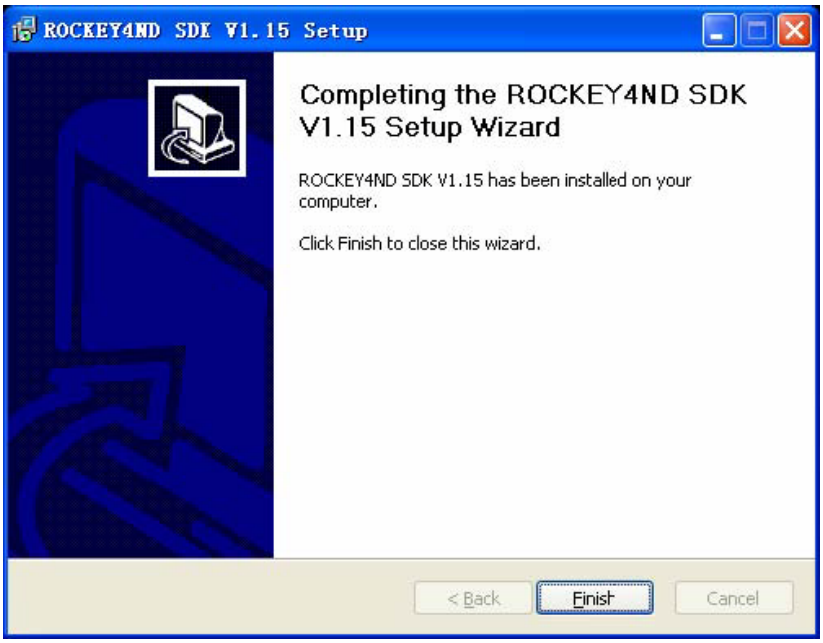

Figure 3.6

3.2 Uninstalling SDK

You may use Add or Remove Programs from the Windows Control Panel or select "FEITIAN" and then "Uninstall" from the Windows Start menu to uninstall the installed components.

Chapter 4. Basic Concepts

This chapter covers the basic concepts and functions of the ROCKEY4ND software protection system. All ROCKEY users should read this chapter carefully to familiarize themselves with ROCKEY.

4.1 Passwords

When developers purchase ROCKEY they will get 4 16-bit passwords. The first two are Basic passwords (first grade passwords); the last two are Advanced passwords (second grade passwords). The 4 passwords for the demo dongles in the SDK are: P1: C44C, P2: C8F8, P3: 0799, P4: C43B. The passwords are "burned" into the hardware so that neither the user nor the manufacturer may change them. The developers must input the 4 passwords correctly to have full access to the dongles. The developer should set any reference to the Advanced password set to zero in the application program that is delivered to the end user – you should never reveal the Advanced passwords to the end user in any form. The Basic passwords allow the end users to access all necessary ROCKEY functions. We will discuss when one should input the Basic passwords, and when both Basic and Advanced passwords are required in the chapters that follow.

4.2 Order Code

The Order Code is five to seven characters in length and corresponds to a unique customer password set. You may use the Order Code for reordering ROCKEY4ND to be sure that all of the units in your inventory are consistent.

4.3 Hardware ID

FEITIAN will burn a globally unique Hardware Identification (HID) number into each ROCKEY4ND dongle. The HID cannot be changed. You may use the HID to positively identify an individual ROCKEY4ND. The HID is readable with the Basic passwords. It is impossible to write HID even if you have the advanced passwords.

4.4 User Data Zone

The User Data Zone (UDZ) is a memory space that the developer can use to store data needed by the software protection system. Users can read from and write to this space at any time. The total UDZ is 1000 bytes. The UDZ is divided into 2 parts.
The low part (0-499 bytes): Users with any level of passwords have full permission (read/write). The high part (500-999 bytes): Users with basic passwords (password 1and password 2) can only read the UDZ. Users with advanced passwords (password 3 and password 4) have full permission (read/write).

4.5 Module Zone

The Module Zone was designed for multi-module encryption. It may be used to store module specific data for

Envelope encryption and/or API calls.

A ROCKEY4ND module is a 16-bit protected memory space. There are 64 "modules" in each ROCKEY4ND dongle, so as many as 64 application modules may be protected with a single ROCKEY4ND dongle. The developer may write data into the ROCKEY4ND modules and then use that data, along with ROCKEY4ND functions, to create powerful and flexible software protection systems. If the content of the module is not "0" you can use the module; if it is "0" you cannot use the module. You may determine if a module is useable by analyzing the attributes of the module. The exact content can only be determined algorithmically.

ROCKEY4ND modules cannot be read and it can only be written with Advanced passwords.

The "Decrement" attribute can be read with the Basic passwords and can be written with the Advanced passwords.

4.6 User Algorithm Zone

The User Algorithm Zone (UAZ) is a user-defined area for instruction storage. The number of instructions that may be stored in the UAZ varies according to the ROCKEY4ND model. ROCKEY4ND supports a maximum of 128 instructions. (Please refer to Chapter 8 ROCKEY4ND Hardware Algorithms.)

The User Algorithm Zone (UAZ) cannot be read and may only be written with Advanced passwords.

4.7 User ID

The User ID is a 32-bit memory allocation that may be used to store an application serial number or other identification information.

It may be read with the Basic passwords and written with the Advanced passwords.

4.8 Random Number

ROCKEY4ND can generate a true random number from its hardware. The random number can be used to prevent tracing or used in hardware algorithms.

4.9 Seed and Return Values

ROCKEY4ND contains a proprietary algorithm that will generate four 16-bit return values from input of a 32-bit seed code and the Basic/Advanced passwords. ROCKEY dongles with the same passwords should return the same values if the seed codes are the same. The return values will be different for ROCKEY dongles with different Basic/Advanced passwords.

Chapter 5. ROCKEY4ND Editor

5.1 Brief Introduction

You may use the ROCKEY4ND Editor to edit data stored in ROCKEY4ND, test its functions or write in batch. The Editor is a convenient tool for learning to use ROCKEY4ND and its edit operations. You can find the tool under *Editor* directory of the SDK or in the installation directory. The ROCKEY4ND Editor interface is organized into five parts: Tool Bar & Pull down Menu, Status Bar, Tree View, Operation Status Log and Operation Main Window. See Figure 5.1.

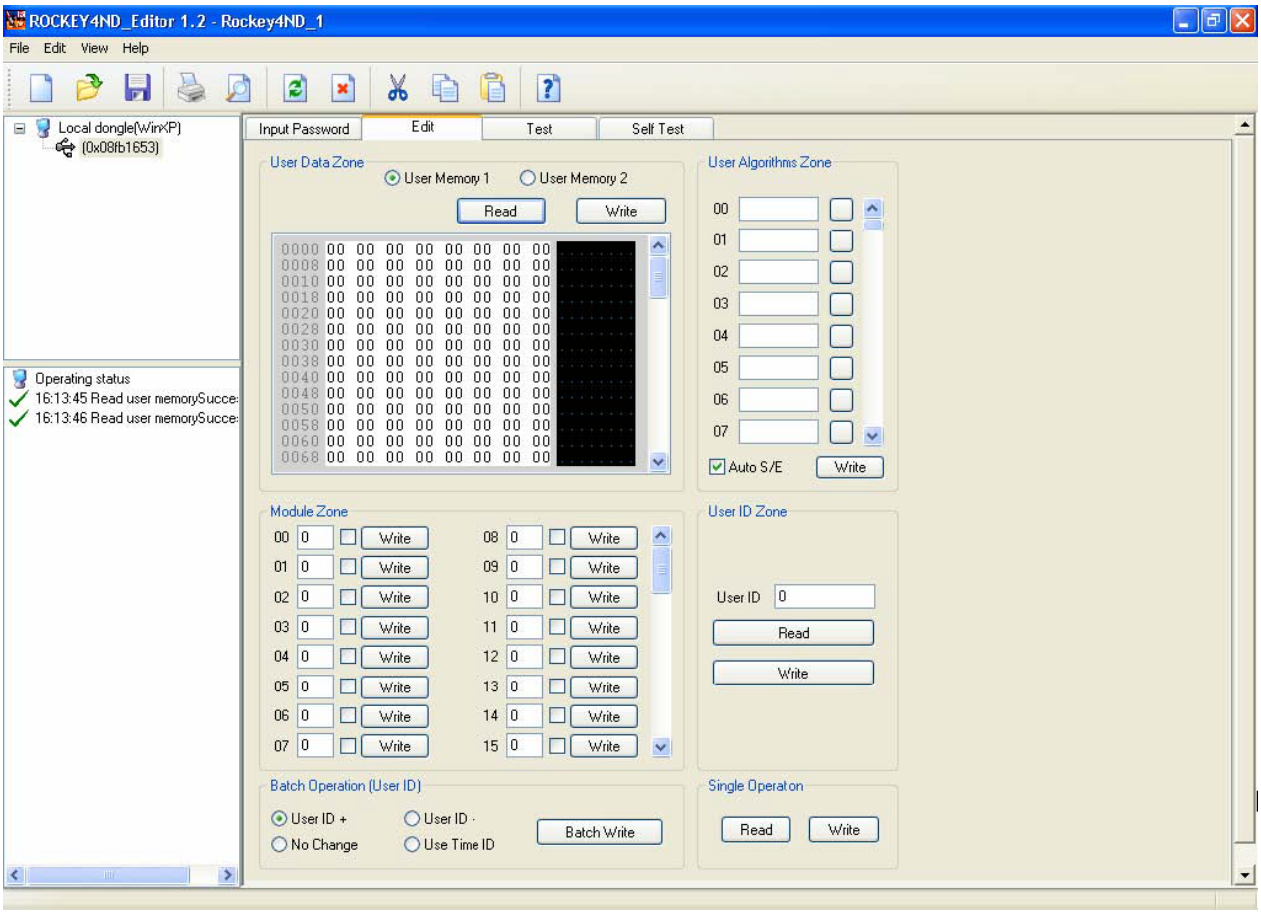

Figure 5.1

1. **Tool Bar & Pull down Menu** - This is the very topmost section of the screen. The typical Windows functions can be invoked from the icons or pull-down menus, such as print, save and refresh. Shortcut keys and icons are also offered.

2. **Status Bar** -The Status Bar is at the bottom of the screen. The Status Bar message is for the dongle selected in the "Device Selector" (See below) portion of the screen. Status messages are: Read, Write and Ready. See Figure 5.2.

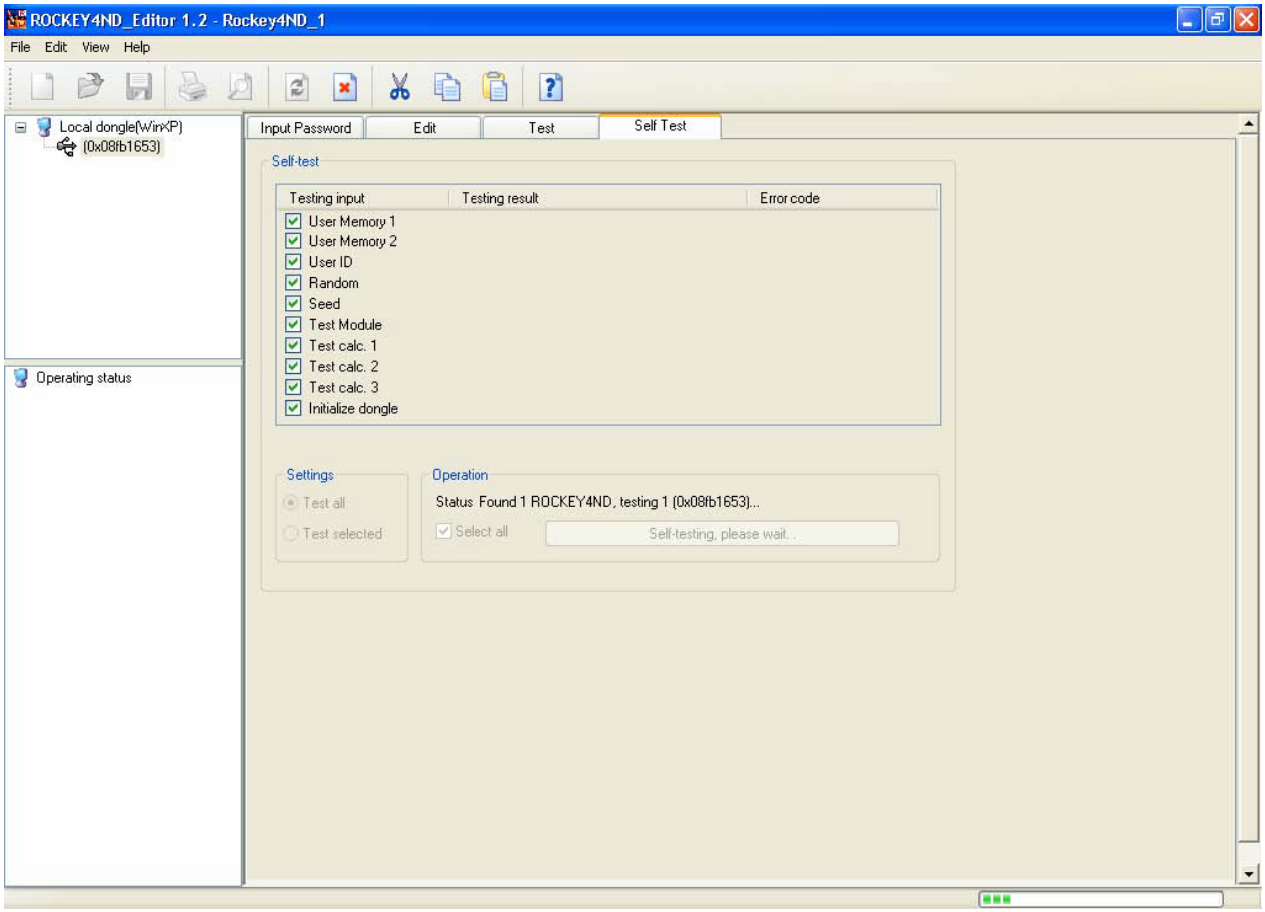

Figure 5.2

3. **Tree View** - This is the upper left portion of the screen and shows the current OS version and ROCKEY4ND dongles that are attached to the computer. See Figure 5.3.

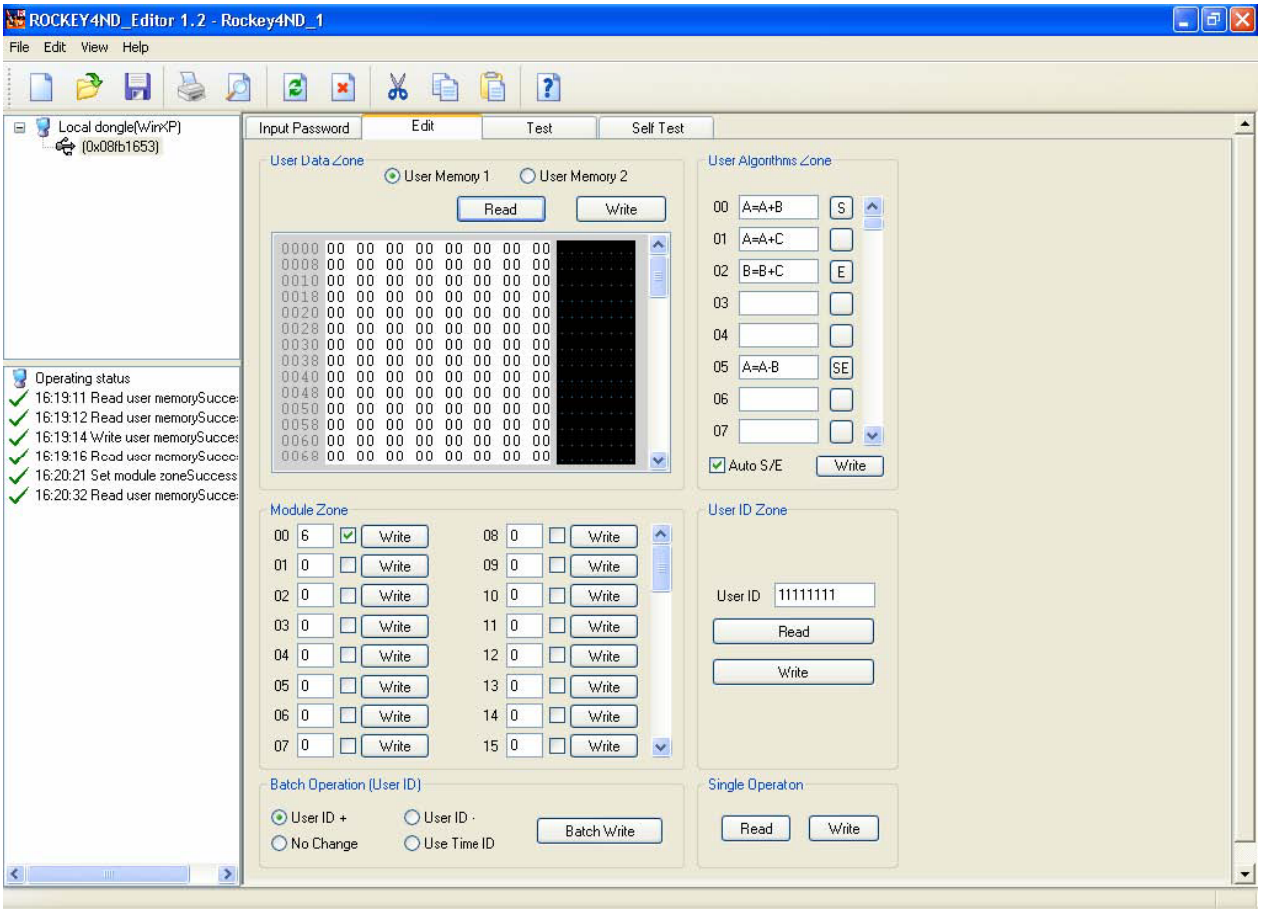

Figure 5.3

4. **Operation Status** - The time, results and error prompt of the previous operations will display here. This section is the lower left portion of the screen. See Figure 5.4.

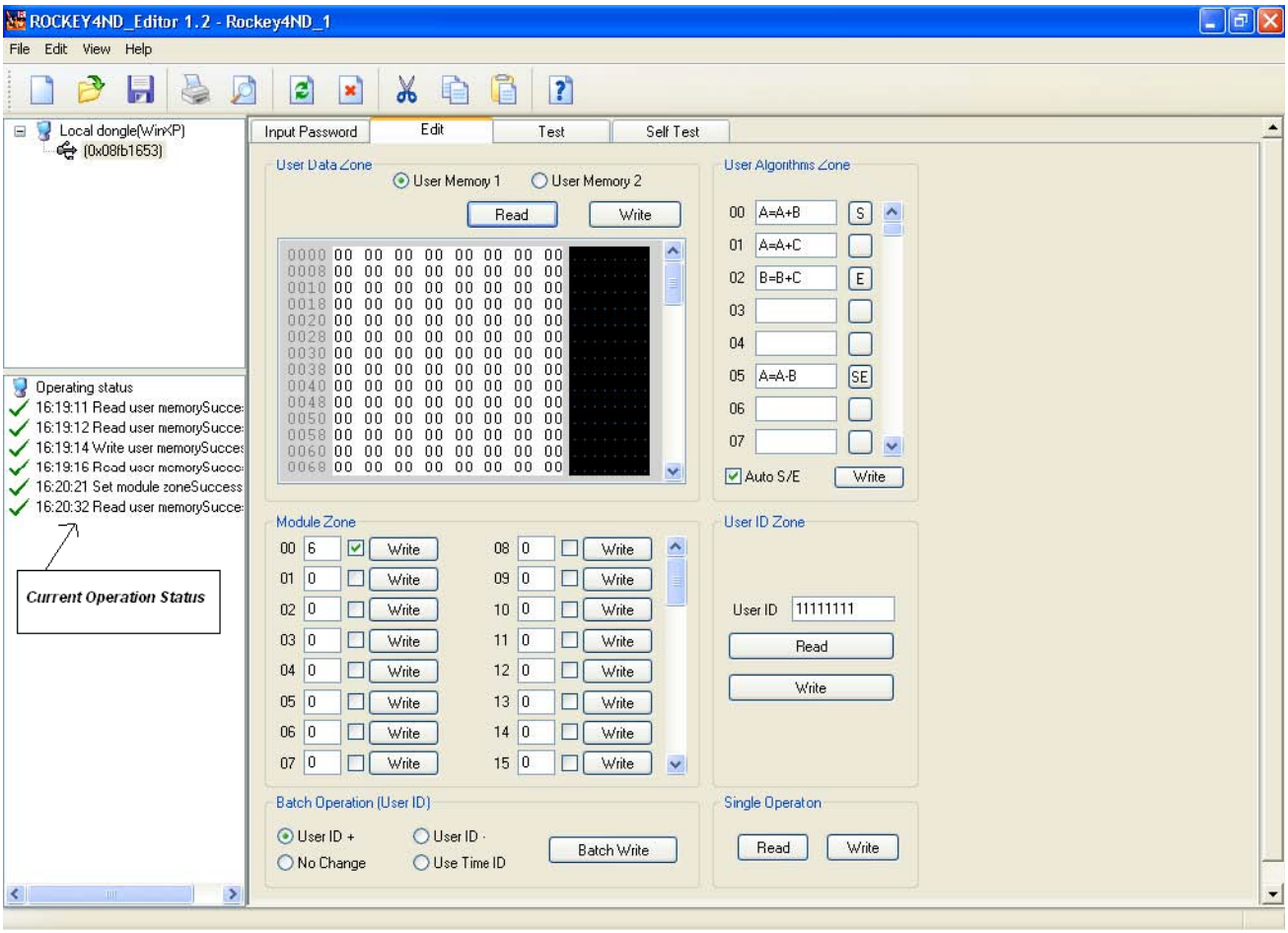

Figure 5.4

5. **Operation Main Window** - The Operation Main Window has five selection tabs: Password, Edit, Test, Self Test and Batch Write. Each tab corresponds to a screen and a function.

Template files (.rki) can be opened by dragging and dropping the template file to the open Editor window. It can also be opened from the file pull down menu in the Editor or by clicking the file from Explorer. You may print preview the template file and print it out. You may use the Editor without a ROCKEY4ND dongle attached to the computer and save the results to a template file. The template file can later be used for a "Write" or "Batch Write" to a ROCKEY4ND dongle(s). The template file may be updated with the Editor while dongles are attached. A progress bar will display all your operation progress and you may stop your operations at any time.

Note: All numbers are input and displayed in hexadecimal with the exception of the number of generated seed codes in the test screen.

5.2 Operation

5.2.1 Input Password

You may enter the Basic and Advanced passwords as shown in Figure 5.5.

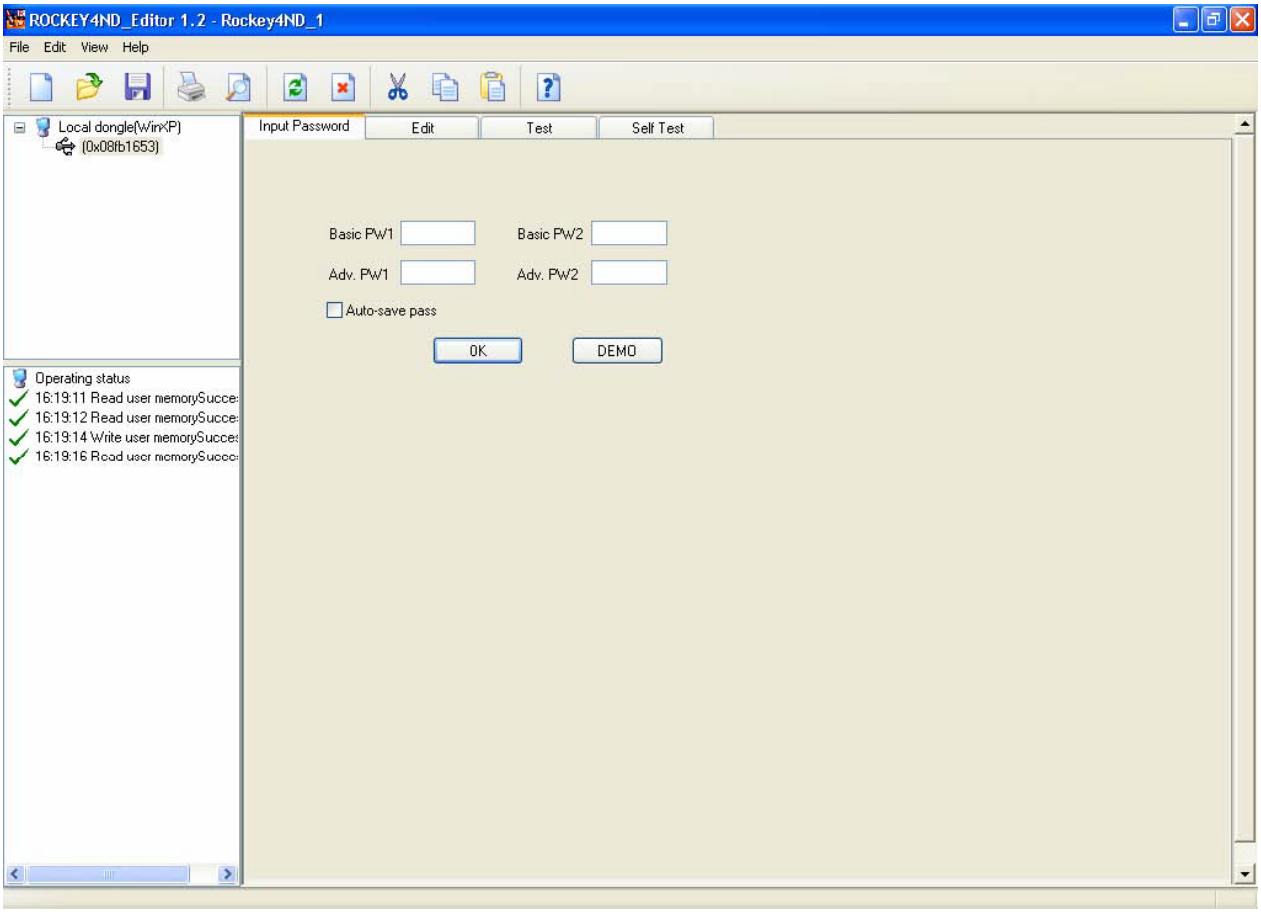

Figure 5.5

Make sure you enter the correct passwords. If the Basic passwords are incorrect Editor cannot find the dongle. If the Basic passwords are correct, and the Advanced passwords are invalid, the Editor should find the dongle and allow Read functions, but it will not allow Write functions.

If you click "DEMO" button, you may perform any operations on DEMO dongles. The 4 passwords for DEMO dongles are: P1: C44C, P2: C8F8, P3: 0799, P4: C43B.

The passwords will be saved automatically when you choose "Auto save password". This function avoids future password entry errors.

If the entered password information corresponds with the attached ROCKEY4ND dongle, you will be taken to the "Edit" screen automatically. The system will automatically begin to search for attached dongles.

Note: You may edit, save, open and print template files without inputting the passwords. However, you cannot operate the dongle without at least the Basic passwords. Entering the Basic passwords will allow you to both edit template files and perform Read operations on the corresponding attached dongle.

5.2.2 Edit

The ROCKEY Hardware ID (HID) is displayed for all found dongles. The HID is globally unique and cannot be changed. See Figure 5.6:

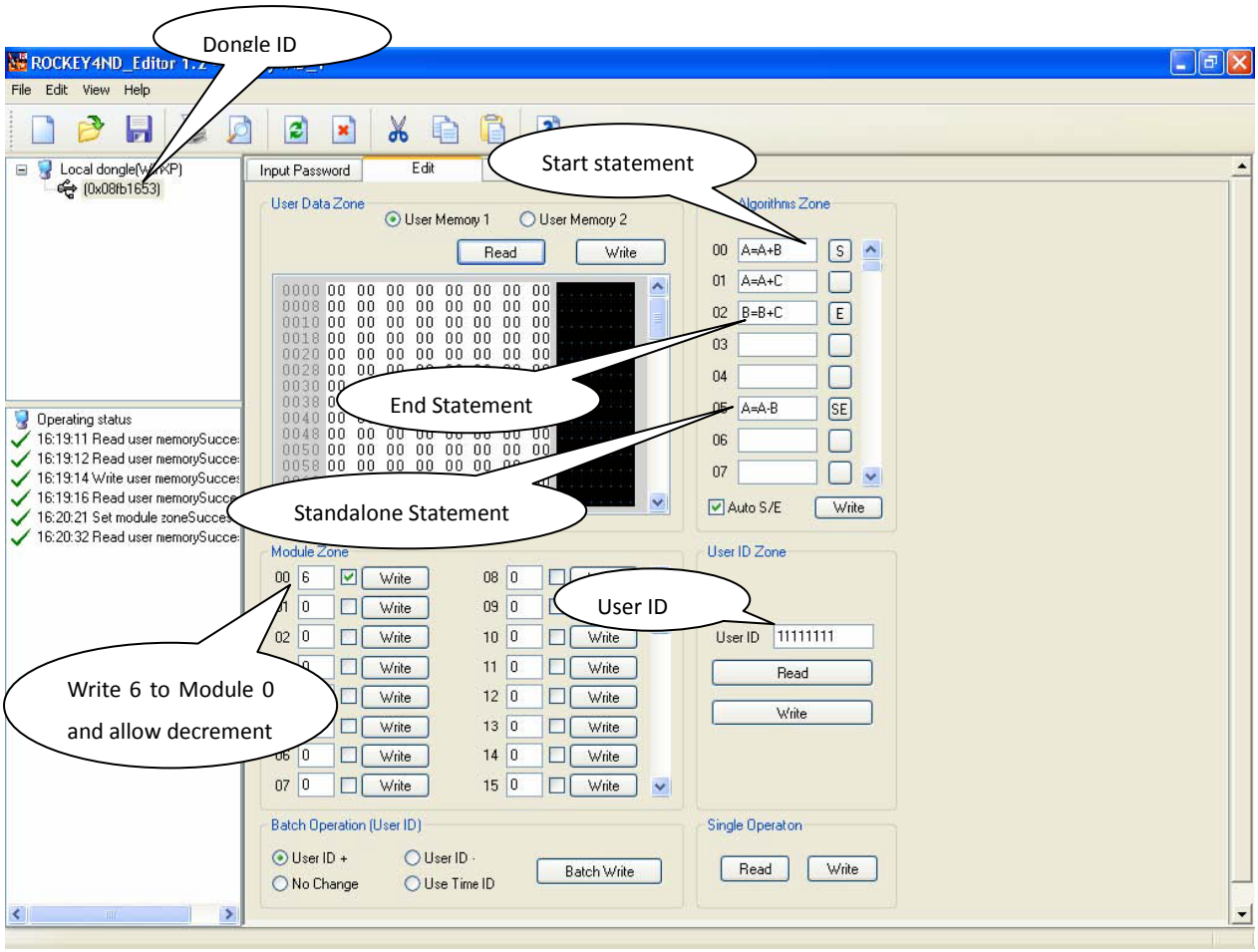

Figure 5.6

Here you may edit the specified ROCKEY. There are 6 components on the Edit screen: User Data Zone (UDZ), Module Zone, User Algorithm Zone (UAZ), User ID Zone (UIZ), Single Operation Zone (SOZ), and Batch Operation Zone (BOZ).

User Data Zone (UDZ) – The UDZ is a user defined memory space. Data may be entered here in hexadecimal or ASCII text in the field provided. Click the "Read" button to read data from the UDZ and "Write" to write to the UDZ.

If you click the Read or Write button a progress bar will appear. After the operations are finished the results will be displayed in the Operation Status section. See Figure 5.6.

Module Zone - This part of the screen is used to update the values and decrement attributes of the ROCKEY4ND modules. To add new values to a module simply enter the new value in the field of the module, and click "Write". The Decrement attribute can likewise be altered. (All 64 ROCKEY4ND modules are displayed here, labeled 0 to F in hexadecimal.)

User Algorithm Zone (UAZ) – You can write some algorithm statements here, which consist of operands and operator(s), such as A=A+B (refer to Chapter 8). There is a button after each statement, marking the statement. The flag of the start statement (S), end statement (E), intermediate statement (blank), and standalone statement

(SE) will be displayed on the button in turn when you click on it. If you check Auto S/E box, the statements you have added will be marked automatically. See Figure 5.6.
User ID Zone (UIZ) - User identification information may be read from or written to the UIZ of the ROCKEY4ND dongle in hexadecimal. See Figure 5.6.

Single Operation Zone (SOZ) – Click Read button to read the content of the dongle that has been selected into the memory. Click Write button to write the content of the memory to the dongle that has been selected.

Batch Operation Zone (BOZ) – You can change all User IDs of the dongles in the edit area. Enter a start ID in the User ID field. Choose a method for setting the ID (see below). Click Batch Write button to update all IDs of the dongles.

- User ID +: The value entered in User ID field will be written to the first dongle of the dongle list. Then, 1 is added onto the value and the updated value is written to the next dongle. For example, the values "124" and "125" will be written to the second dongle and the third dongle respectively after the initial value "123" is written to the first dongle if User ID + radio button is checked and Batch Write button is clicked.
- User ID -: Its function is similar to that of User ID + button, except that the ID value is descended.
- Use Time ID: Use the time value of the system clock as the User ID.
- No Change: The value of User ID field will be written to each of the dongles in the list, without any change.

5.3 Save Work

The template can be saved to the disk or be printed for backup.

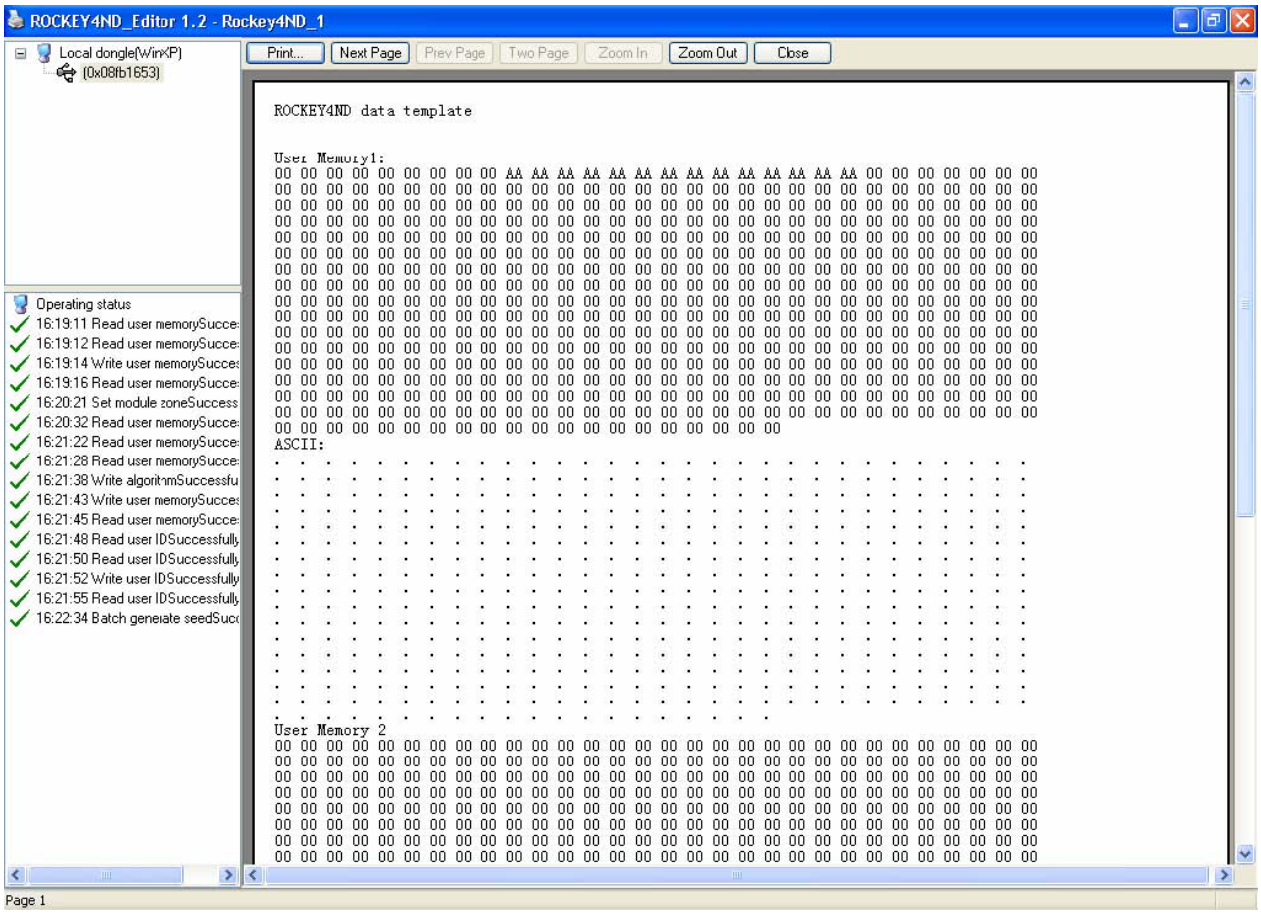

Figure 5.7

5.3.1 Test

There are five components to the Test screen: User Data Zone (UDZ), Calculation Zone, User ID Zone (UIZ), Module Attribute Zone and the Seed Calculation Zone. See Figure 5.8.

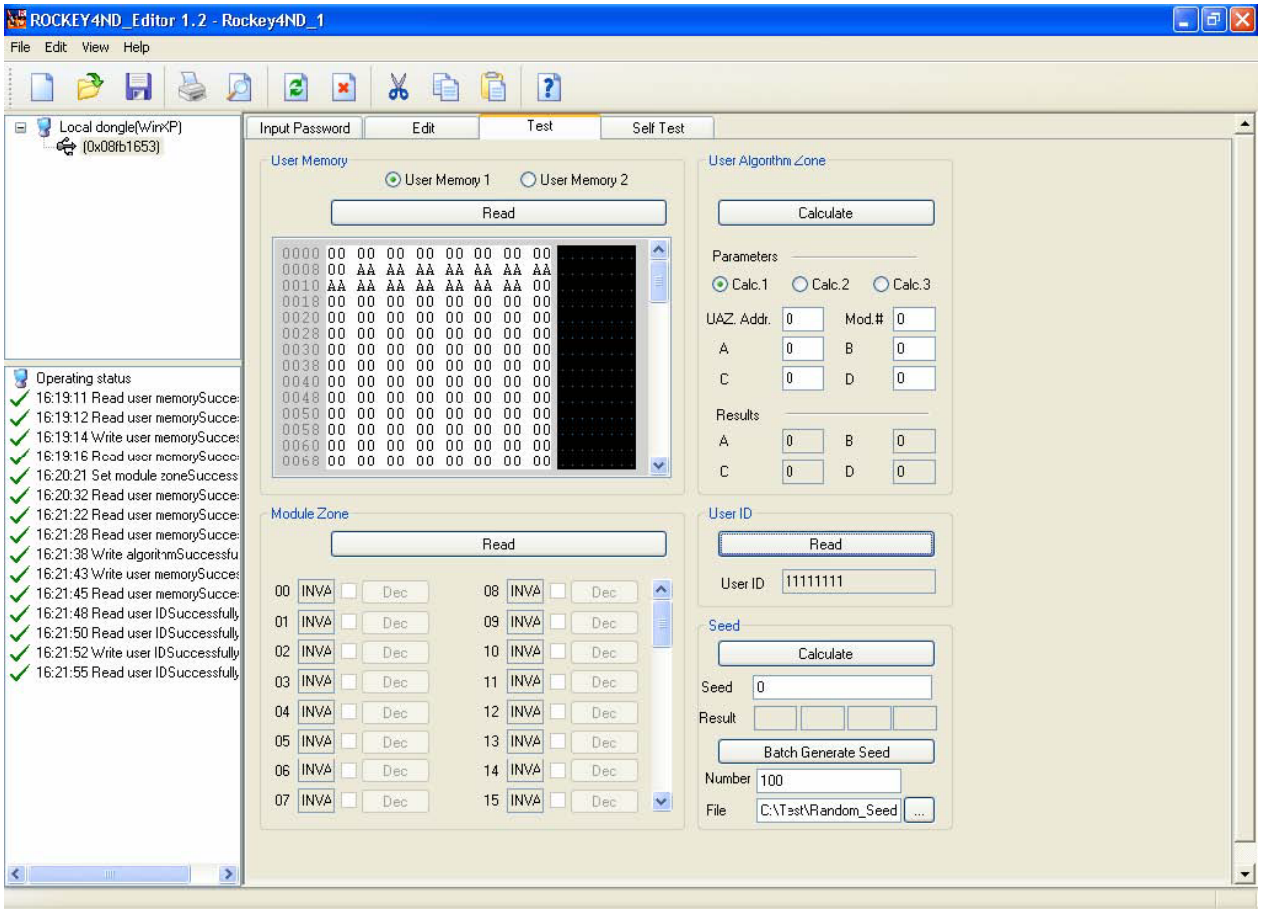

Figure 5.8

User Data Zone –The UDZ is a user defined memory space. Data may be displayed in hexadecimal form, or as ASCII text. Click the "Read" button to read data from the UDZ. You may view hexadecimal data or ASCII text here.

Calculation Zone – Be sure that you are familiar with the calculation functions before using the Calculation Zone. First select the calculation you would like to test (For Calc1 and Calc3 a "Module" entry box will appear. For Calc2 a "Seed Code" box will appear.). Then input the start address of your algorithm stored in the UAZ. The start address is where the instruction is marked with "S" or "SE". Enter hexadecimal input values to the parameter A, B, C and D. Enter the module number or seed code and click the "Calculate" button. The results of the operation will be written to the parameters listed in the "Results" section of the Calculation Zone.

User ID Zone (UIZ) – Click the "Read" button to read the user defined ID from the UIZ of the ROCKEY4ND dongle UIZ is 32 bits in length.

Module Attribute Zone – This zone indicates the status of the Zero Value and Decrement attributes of the ROCKEY4ND modules. Click the "Read Module Attributes" button to update this portion of the Test screen. "N/A" means that the Zero Value attribute is "0". "Valid" means the Zero Value attribute is not "0". If the "Dec" button is grayed out the module cannot be decremented. If it is to be decremented, clicking the "Dec" button will reduce the value stored in the module by "1".

Seed Calculation Zone – There are two small sections to the Seed Calculation Zone. The top section will display four calculated seed results for any entered seed code. Enter a decimal number in the "Number Generate" field in the bottom section, and that same number of random seed codes and corresponding results will be written to a text file defined in the "File" field. The default file is Random_Seed.txt under the directory of the executable.

5.3.2 Self-test

Test all ROCKEY4ND dongles attached to the computer one by one or test only selected dongle(s). First, you can specify the items that will be tested. All specified dongles will be tested automatically.

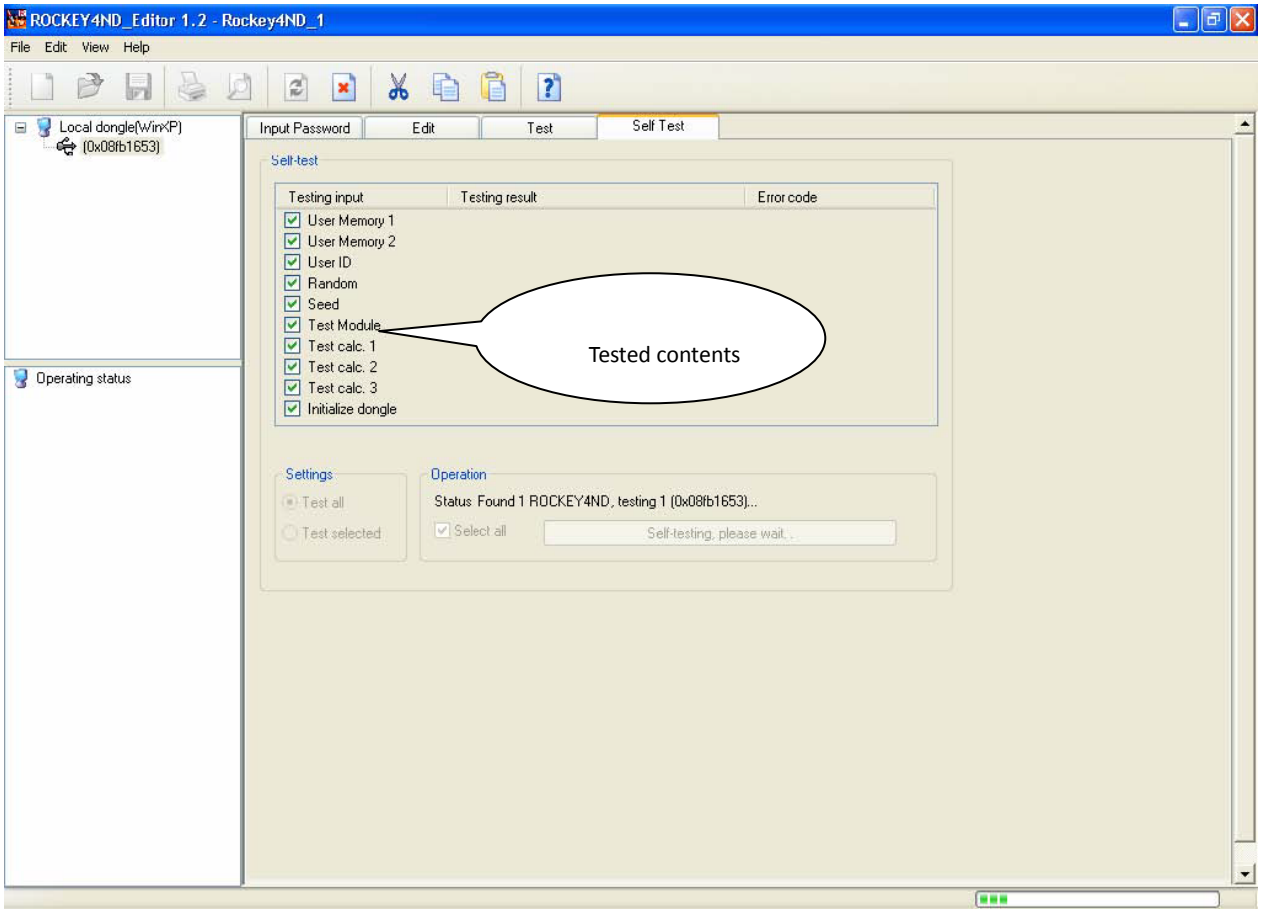

Figure 5.9

Note: This test is like a "Format" command in that it will delete any data or parameters stored in the dongle. It would be best to run the Self Test upon receipt of the dongle or if there is a significant problem with the dongle.

Chapter 6. ROCKEY4ND Envelope Encryption

The ROCKEY4ND Envelope encryption is a good solution if you do not have the source code or the time to use the API functions.

Currently, the envelope tool has the following features:

1. The components of the envelope tool include the interface program for entering parameters by users, the enveloper based on the command line, and the enveloper module on the dongle.
2. Interface program
   A. Parameters for all dongles from Feitian are supported.
   B. The encryption parameters for PE, .NET, and data envelope files are supported. The files are divided into two types: program and data.
   C. Program types that can be recognized automatically: win32PE, WIN64PE, WIN32.NET, and WIN64.NET
   D. Supported language environments: Simplified Chinese, Traditional Chinese, and English. More can be specified by adding self-defined language environments to the folder *language*. A maximum of 16 language files can be specified for now.
   E. When there is only one .DLL file in folder WIN32_PE, the dongle selection dialog box will not be displayed, and the dongle type will be selected automatically to facilitate the integrated or individual release of this system.
   F. The types of the envelope file supported by the current dongle can be recognized automatically according to the presence of related .DLL file in the folder. When an unsupported file type is added, a message will be displayed.
3. The enveloper based on the command line
   A. If you do not want to use the interface program, you can develop a self-defined upper-level interface based on this command line program.
   B. Apparently, the commands of the command line program are complex. If you do not want to learn how to use them, the C source files for generating a command line from data structure can be available upon request to facilitate your development of interface.
4. The enveloper module on the dongle

This is the core module for implementing different types of dongle and file enveloping. By developing this module and place it into a corresponding folder, the required functions can be achieved, independent of the upper-level interface and the command line program. Currently, the following modules have been implemented: win32_PE, win32_DOTNET, and win32_DATA for Rockey4ND, and win32_PE, win32_DOTNET, and win32_DATA for NetRockey4ND.

Screenshots:

Choose a dongle type (this box is not displayed if there is only one .DLL file under WIN32_PE folder):

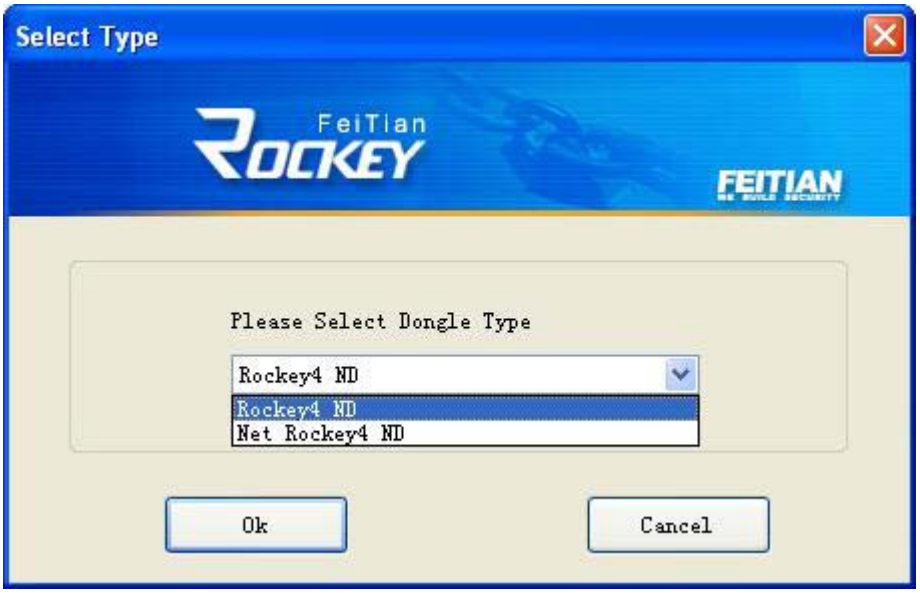

Figure 6.1

Main interface:

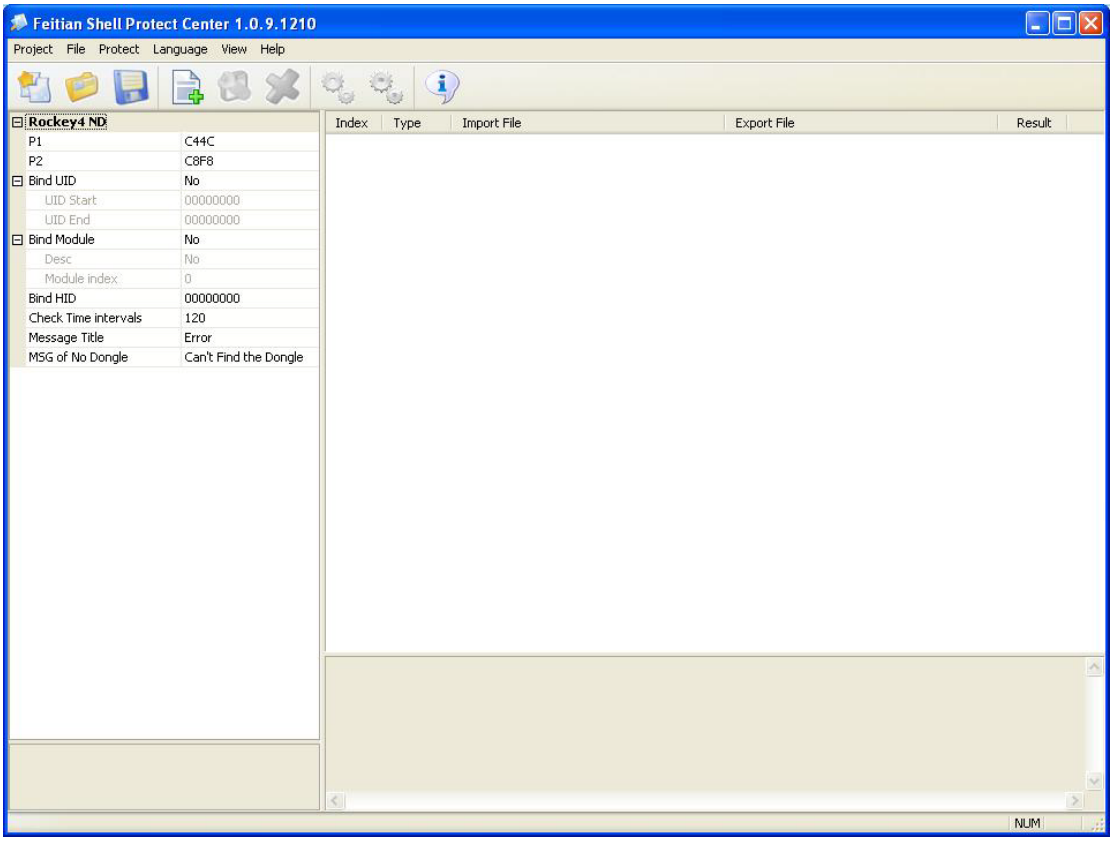

Figure 6.2

Rockey4ND dongle options:

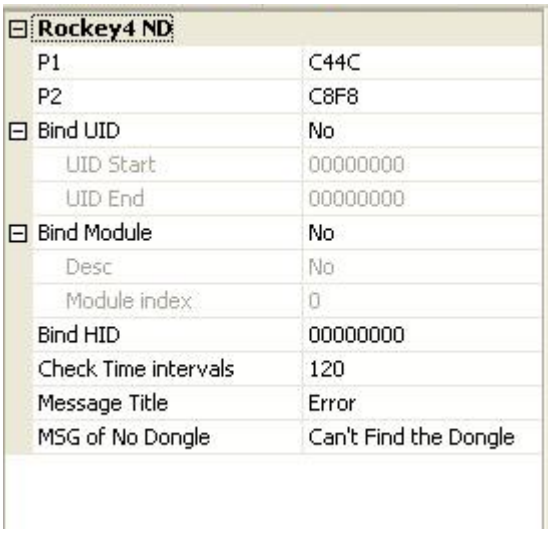

Figure 6.3

Add File dialog box:

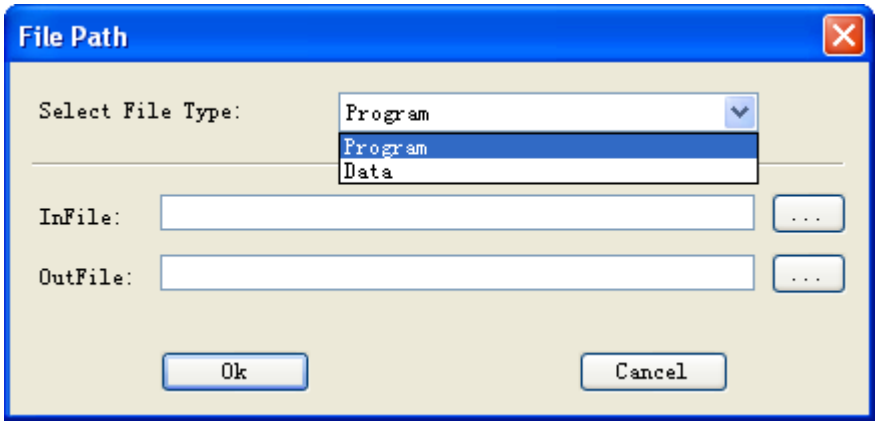

Figure 6.4

The file type is recognized automatically. When a file is selected, related envelope options are displayed on the right side:

PE envelope options:

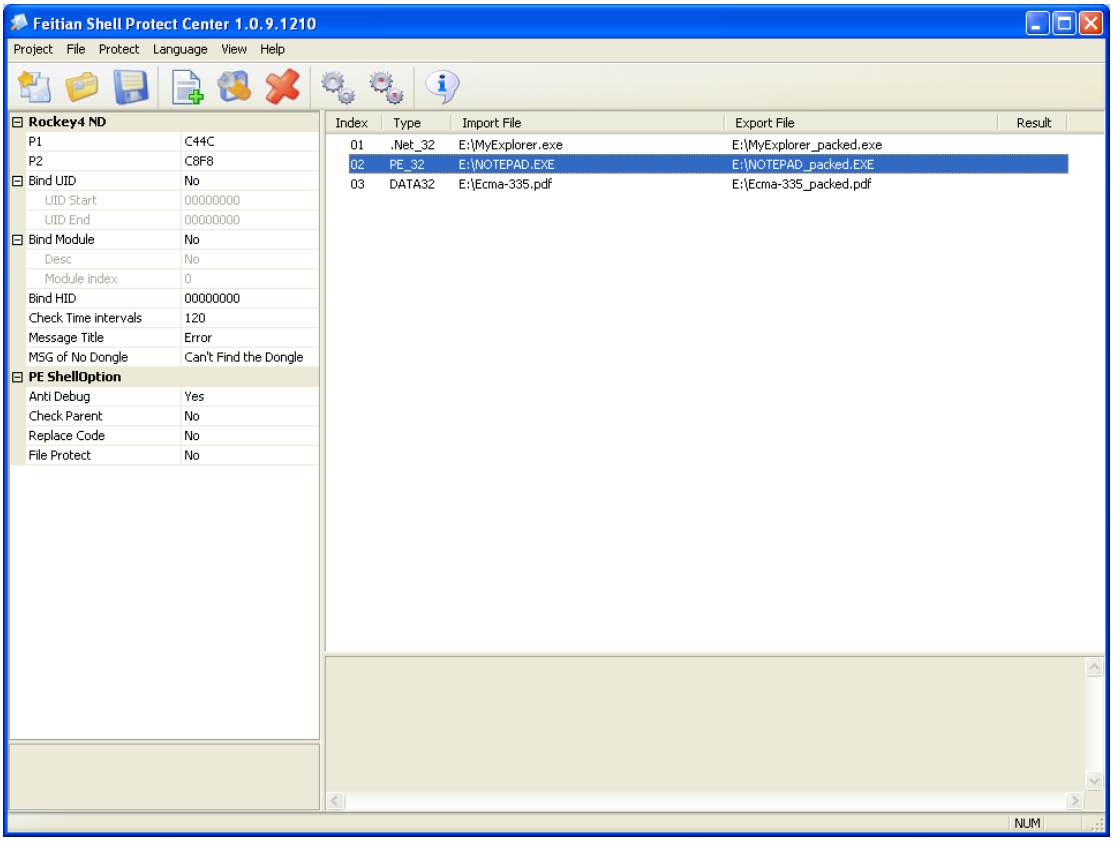

Figure 6.5

.Net envelope options:

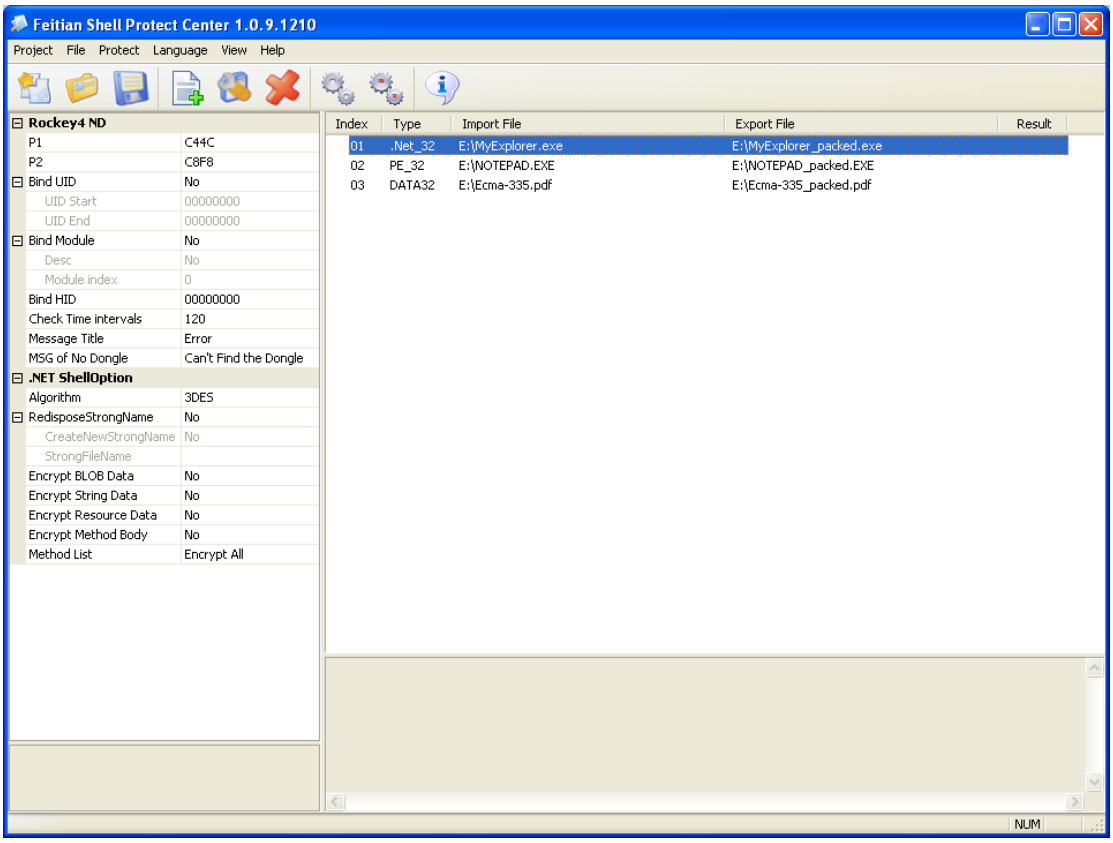

Figure 6.6

Choose a function or functions to be encrypted:

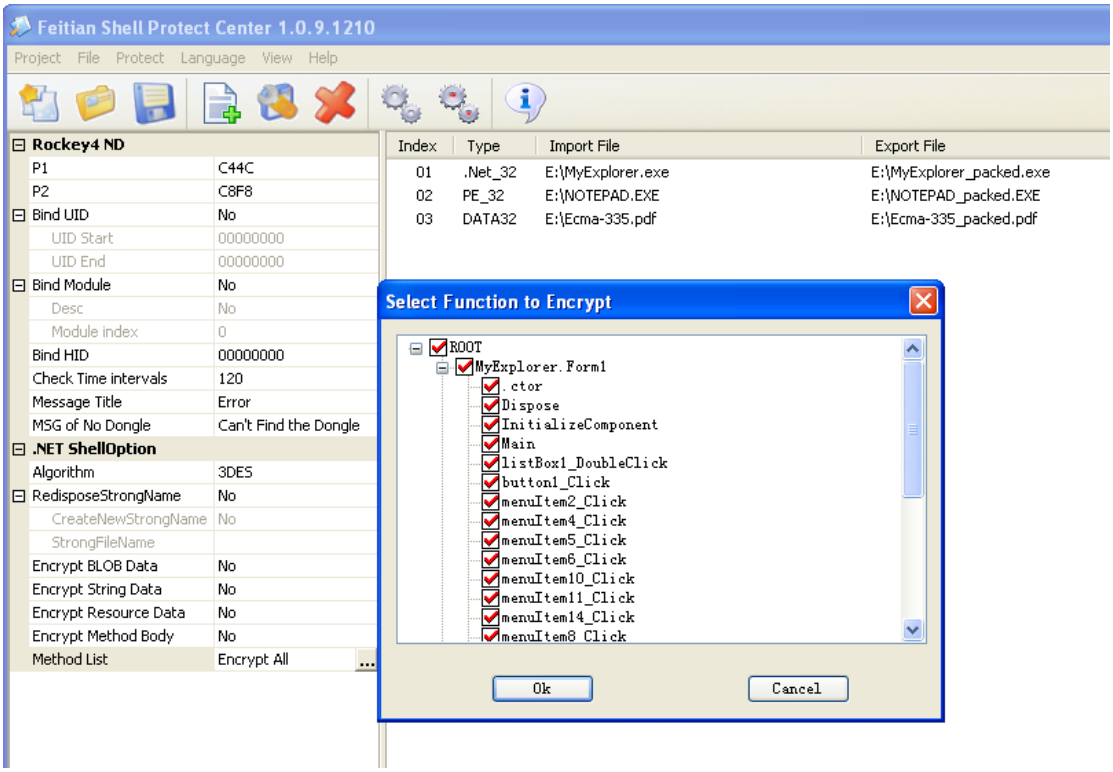

Figure 6.7

Date protection options:

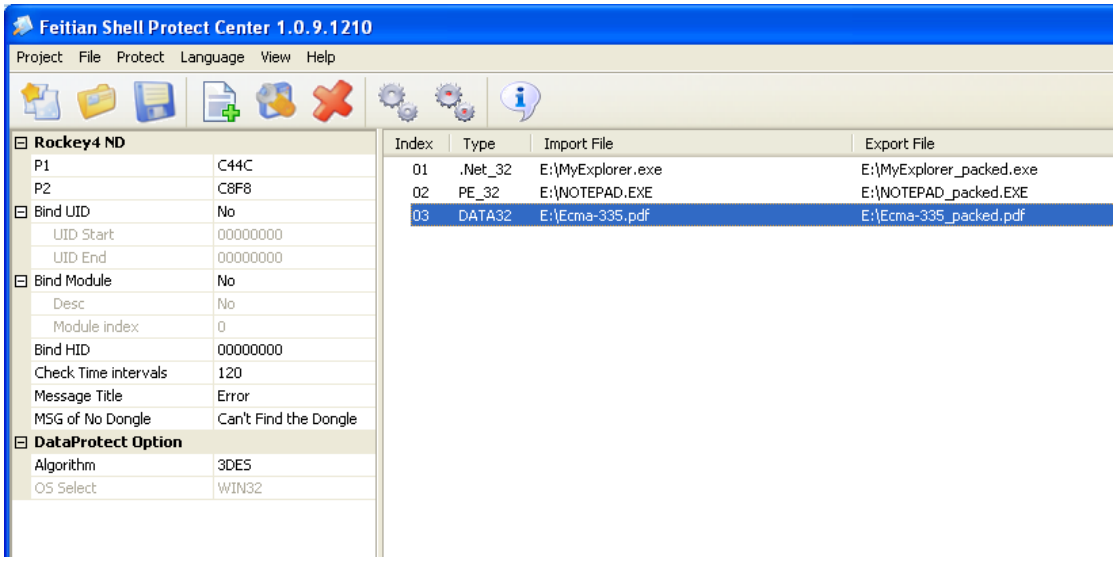

Figure 6.8

Net Rockey4 ND dongle options:

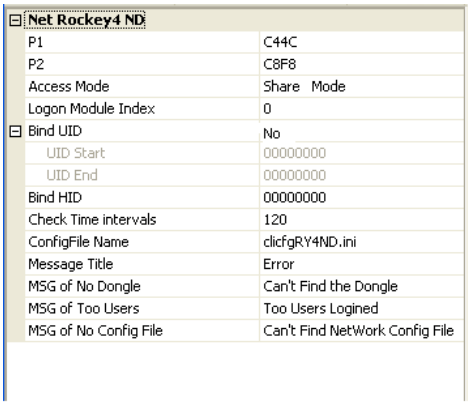

Figure 6.9

Results after adding an envelope:

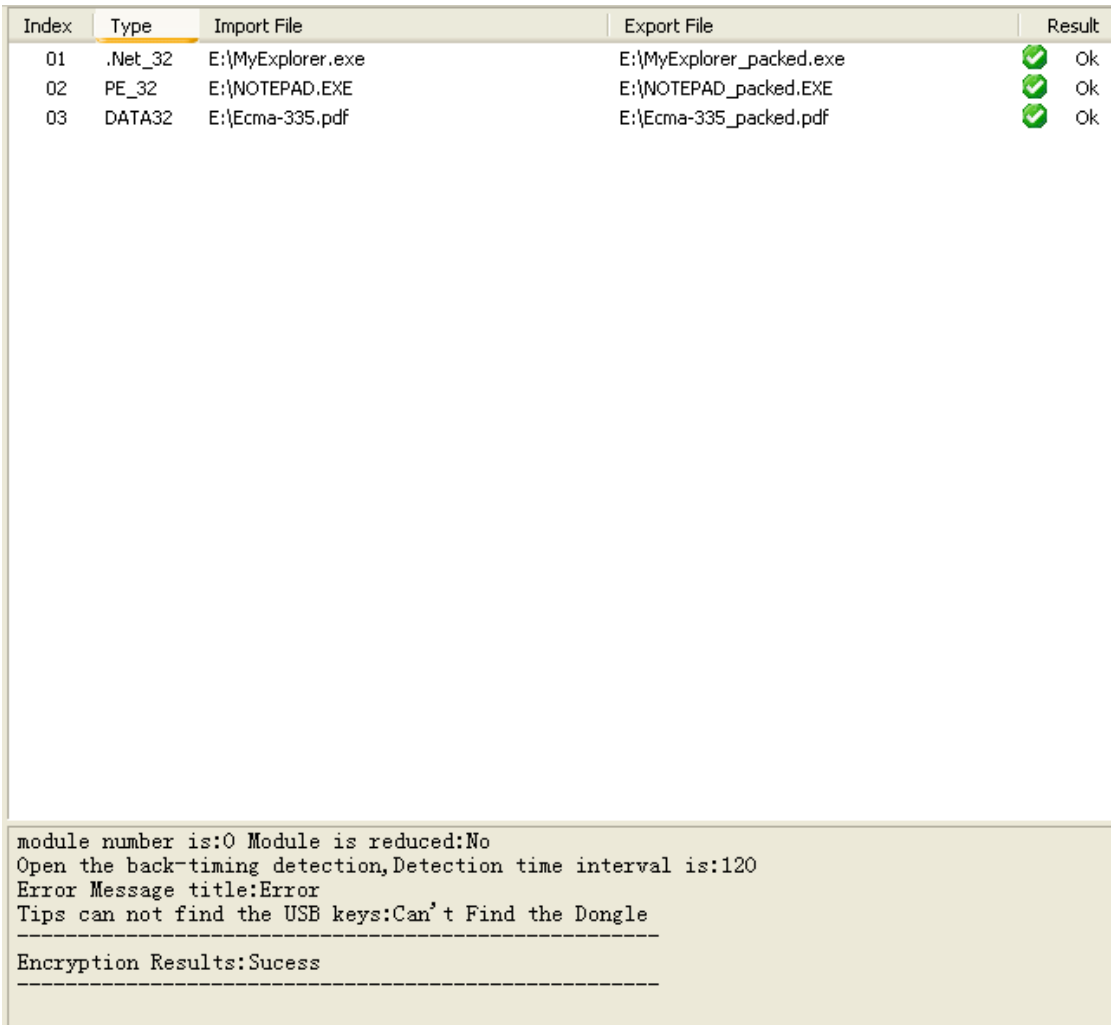
Index
Type
Import File
Export File
Result
01
.Net_32
E:\MyExplorer.exe
E:\MyExplorer_packed.exe
Ok
02
PE_32
E:\NOTEPAD.EXE
E:\NOTEPAD_packed.EXE
Ok
03
DATA32
E:\Ecma-335.pdf
E:\Ecma-335_packed.pdf
Ok
module number is:0 Module is reduced:No
Open the back-timing detection,Detection time interval is:120
Error Message title:Error
Tips can not find the USB keys:Can't Find the Dongle
Encryption Results:Sucess

Figure 6.10

Chapter 7. ROCKEY4ND APIs

The ROCKEY4ND Application Programming Interface (API) is the most flexible and powerful means of protecting your software. The security level of your software is determined by how you implement the API. The API set has been simplified and is intended to make the ROCKEY4ND programming effort as effective as possible.
API encryption enables you to call ROCKEY in your application to enhance its security level. You may check the existence of the dongle anywhere in your application and take actions as a result of the check. You may also check the data you stored in the UDZ.
You may use the Editor program to set and write data to the modules, write algorithms to the User Algorithm Zone (UAZ), user information to the User ID zone (UID) or take other actions. All such operations may be performed with the API.
We will take the interface of the C language to demonstrate how to call the API. Similarly, you may call other language interfaces the same way.

7.1 ROCKEY4ND Function Prototype and Definition

```
WORD Rockey
(
WORD function,
WORD* handle,
DWORD* lp1,
DWORD* lp2,
WORD* p1,
WORD* p2,
WORD* p3,
WORD* p4,
BYTE* buffer
);
```

FEITIAN provides developers with a unified function from which they can employ all ROCKEY4ND operations.
This function is defined as a multi-function function.
Below is a call example for C language, and we will discuss future applications in a similar way. retcode = Rockey(function,handle,lp1,lp2,p1,p2,p3,p4,buffer);
The "ROCKEY" function parameters are defined as: Note: All interface parameters must be defined in your program.
ROCKEY4ND cannot transfer NULL or 0 pointers. Use of Null or 0 pointers in your program will generate an error.

Parameter Name	Parameter Type	Parameter Meaning
Function	A 16-bit number	API function
Handle	Address of a 16-bit	ROCKEY4ND session

	number	address
lp1	Address of a 32-bit number	long parameter 1
lp2	Address of a 32-bit number	long parameter 2
p1	Address of a 16-bit number	parameter 1
p2	Address of a 16-bit number	parameter 2
p3	Address of a 16-bit number	parameter 3
p4	Address of a 16-bit number	parameter 4
Buffer	Address of a 8-bit number	Buffer

Note: All parameters must be defined in the program. Do not pass a Null pointer. Otherwise, an error will occur.

- "function" is a 16-bit number. It stands for the specific function and it is defined below:

Parameter Name	Parameter Type	Parameter Meaning
RY_FIND	1	// Find ROCKEY4ND
RY_FIND_NEXT	2	// Find next ROCKEY4ND
RY_OPEN	3	// Open ROCKEY4ND
RY_CLOSE	4	// Close ROCKEY4ND
RY_READ	5	// Read ROCKEY4ND
RY_WRITE	6	// Write ROCKEY4ND
RY_RANDOM	7	// Generate Random Number
RY_SEED	8	// Generate Seed Code
RY_WRITE_USERID	9	// Write User ID
RY_READ_USERID	10	// Read User ID
RY_SET_MOUDLE	11	// Set Module
RY_CHECK_MOUDLE	12	// Check Module

RY_WRITE_ARITHMETIC 13		// Write Arithmetic
RY_CALCULATE1	14	// Calculate 1
RY_CALCULATE2	15	// Calculate 2
RY_CALCULATE3	16	// Calculate 3
RY_DECREASE	17	// Decrease Module Unit

- "handle" is the pointer for ROCKEY operation's handle.
- "lp1" and "lp2" are the pointers for long integer parameters. Their content depends on the functions.
- "p1", "p2", "p3" and "p4" are the pointers for short integer parameters. Their content depends on the functions.
- "buffer" is the pointer for character buffer. Its content depends on the functions.

7.2 ROCKEY4ND API Services

Here we discuss the API services in detail. The following functions marked with [*] require the two Advanced passwords.

Note: p3 and p4 are Advanced passwords. They are for developers to operate on the dongle. The Advanced passwords should not appear in the software you offer to your customers and you should set the two Advanced passwords "0" when searching for dongles in your application.

7.2.1 Find a ROCKEY4ND dongle (RY_FIND)

Objective: To check if a specific ROCKEY4ND is attached to the USB port.
Input parameters:
function = RY_FIND
**p1 = Password 1*
**p2 = Password 2*
**p3 = Password 3 (optional)*
**p4 = Password 4 (optional)*
Return value:
A return value = "0" indicates that the function worked correctly. Any other return value indicates an error. A successful operation will write the ROCKEY4ND Hardware ID (HID) to *lp1.

7.2.2 Find the Next ROCKEY4ND dongle (RY_FIND_NEXT)

Objective: To check if another specific ROCKEY4ND is attached to the USB port.
Input parameters:
function = RY_FIND_NEXT
**p1 = Password 1*
**p2 = Password 2*
**p3 = Password 3 (optional)*
**p4 = Password 4 (optional)*
**lp1 = The hardware ID of the last dongle found by RY_FIND or RY_FIND_NEXT*

Return value:

A return value = "0" indicates that the function worked correctly. Any other return value indicates an error. A successful operation will write the ROCKEY4ND Hardware ID (HID) to *lp1.

7.2.3 Open the ROCKEY4ND dongle (RY_OPEN)

Objective: To open a ROCKEY4ND dongle with specified passwords or hardware ID.

Input parameters:

function = RY_OPEN

**p1 = Password 1*

**p2 = Password 2*

**p3 = Password 3 (optional)*

**p4 = Password 4 (optional)*

**lp1= Hardware ID*

Return value:

A return value = "0" indicates that the function worked correctly. Any other return value indicates an error. A successful operation will write the handle address to the *handle parameter

7.2.4 Close the ROCKEY4ND dongle (RY_CLOSE)

Objective: To close a ROCKEY4ND dongle with a specific handle.

Input parameters:

function = RY_CLOSE

**handle = ROCKEY4ND's handle*

Return value:

A return value = "0" indicates that the function worked correctly. Any other return value indicates an error.

7.2.5 Read the ROCKEY4ND dongle (RY_READ)

Objective: To read the contents of the User Data Zone (UDZ).

Input parameters:

function = RY_READ

**handle = ROCKEY4ND's handle*

**p1 = off set of UDZ(zero base)*

**p2 = length (unit is byte)*

buf = address of buffer

Return value:

A return value = "0" indicates that the function worked correctly. Any other return value indicates an error. A successful operation will result in the contents of the UDZ written to the memory buffer.

7.2.6 Write to the ROCKEY4ND dongle (RY_WRITE)

Objective: To write data to the User Data Zone. (UDZ)

Input parameters:

function = RY_WRITE

**handle = ROCKEY4ND's handle*

**p1 = off set of UDZ*

**p2 = length (unit is byte)*

buf = address of buffer

Return value:

A return value = "0" indicates that the function worked correctly. Any other return value indicates an error.

7.2.7 Generate a Random Number (RY_RANDOM)

Objective: To get a random number from the dongle.

Input parameters:

function = RY_RANDOM

**handle = ROCKEY4ND's handle*

Return value:

A return value = "0" indicates that the function worked correctly. Any other return value indicates an error. A successful operation will result in the *p1 address populated with the random number.

7.2.8 Generate Seed Code Return Values (RY_SEED)

Objective: To get return codes from the input of a seed code.

Input parameters:

function = RY_SEED

**handle = ROCKEY4ND's handle*

**lp2 = Seed Code*

Return value:

A return value = "0" indicates that the function worked correctly. Any other return value indicates an error. A successful operation will result in the following addresses populated with seed code return values: *p1 = Return Code 1 *p2 = Return Code 2 *p3 = Return Code 3 *p4 = Return Code 4

7.2.9 Write the User ID [*] (RY_WRITE_USERID)

Objective: To write the user defined "User ID" to the User ID Zone (UIZ).

Input parameters:

function = RY_WRITE_USERID

**handle = ROCKEY4ND's handle*

**lp1 = User ID*

Return value:

A return value = "0" indicates that the function worked correctly. Any other return value indicates an error.

7.2.10 Read User ID (RY_READ_USERID)

Objective: To read the user defined "User ID" from the User ID Zone (UIZ).

Input parameters:

function = RY_READ_USERID

**handle = ROCKEY4ND's handle*

Return value:

A return value = "0" indicates that the function worked correctly. Any other return value indicates an error. A successful operation will result in the *lp1 address populated with the User ID.

7.2.11 Set a ROCKEY4ND Module [*] (RY_SET_MOUDLE)

Objective: To write a value to a specific ROCKEY4ND module and set the Decrement attribute.

Input parameters:
function = RY_SET_MOUDLE
**handle = ROCKEY4ND's handle*
**p1 = Module Number*
**p2 = Module Unit Value*
**p3 = If decreasing is allowed (1 = allowed, 0 = not allowed)*
Return value:
A return value = "0" indicates that the function worked correctly. Any other return value indicates an error. A successful operation will result in module unit # "*p1" storing value "*p2" and the Decrement attribute set to "0" or "1".

7.2.12 Check a ROCKEY4ND Module (RY_CHECK_MOUDLE)

Objective: To read the attributes of a specific ROCKEY4ND module.
Input parameters:
function = RY_CHECK_MOUDLE
**handle = ROCKEY4ND's handle*
**p1 = Module Number*
Return value:
A return value = "0" indicates that the function worked correctly. Any other return value indicates an error. A successful operation will result in "*p2" populated in the value from the Zero Value attribute (1 = module value is not zero), and "*p3" populated with the value from the Decrement attribute (1 = module can be decreased).

7.2.13 Write Arithmetic [*] (RY_WRITE_ARITHMETIC)

Objective: To write user-defined mathematical instructions to the User Algorithm Zone (UAZ).
Input parameters:
function = RY_WRITE_ARITHMETIC
**handle = ROCKEY4ND's handle*
**p1 = position of first instruction in UAZ*
buffer = buffer address of the algorithm command string
Return value:
A return value = "0" indicates that the function worked correctly. Any other return value indicates an error. A successful operation will result in the UAZ populated with the algorithm command string from the buffer.

7.2.14 Calculate 1 (RY_CALCULATE1)

Objective: To return the results of a calculation performed in ROCKEY4ND, using input provided by the developer and the RY_CALCULATE1 function.
Input parameters:
function = RY_CALCULATE1
**handle = ROCKEY4ND's handle*
**lp1 = Start point of calculation*
**lp2 = Module number*
**p1 = Input value 1*
**p2 = Input value 2*
**p3 = Input value 3*

**p4 = Input value 4*

Return value:

A return value = "0" indicates that the function worked correctly. Any other return value indicates an error. A successful operation will result in the addresses p1, p2, p3 and p4 populated with the results of the calculation.

7.2.15 Calculate 2 (RY_CALCULATE2)

Objective: To return the results of a calculation performed in ROCKEY4ND, using input provided by the developer and the RY_CALCULATE2 function.

Input parameters:

function = RY_CALCULATE2

**handle = ROCKEY4ND's handle*

**lp1 = Start point of calculation*

**lp2 = Seed Code (32-bit)*

**p1 = Input value 1*

**p2 = Input value 2*

**p3 = Input value 3*

**p4 = Input value 4*

Return value:

A return value = "0" indicates that the function worked correctly. Any other return value indicates an error. A successful operation will result in the addresses p1, p2, p3 and p4 populated with the results of the calculation.

7.2.16 Calculate 3 (RY_CALCULATE3)

Objective: To return results of a calculation performed in ROCKEY4ND, using input provided by the developer and the RY_CALCULATE3 function.

Input parameters:

function = RY_CALCULATE3

**handle = ROCKEY4ND's handle*

**lp1 = Start point of calculation*

**lp2 = Module number*

**p1 = Input value 1*

**p2 = Input value 2*

**p3 = Input value 3*

**p4 = Input value 4*

Return value:

A return value = "0" indicates that the function worked correctly. Any other return value indicates an error. A successful operation will result in the addresses p1, p2, p3 and p4 populated with the results of the calculation.

7.2.17. Decrease Module Unit (RY_DECREASE)

Objective: To decrease the value in a specified ROCKEY4ND module by "1".

Input parameters:

function = RY_DECREASE

**handle = ROCKEY4ND's handle*

**p1 = Module number*

Return value:

A return value = "0" indicates that the function worked correctly. Any other return value indicates an error. A successful operation will reduce the value stored in module *p1 by "1".

7.3 Error Codes

ERR_SUCCESS	0	//No error
ERR_NO_ROCKEY	3	//No ROCKEY4ND found
ERR_INVALID_PASSWORD	4	//ROCKEY4ND found, with incorrect basic password
ERR_INVALID_PASSWORD_OR_ID	5	//Incorrect password or hardware ID
ERR_SETID	6	//Error setting hardware ID
ERR_INVALID_ADDR_OR_SIZE	7	//Incorrect target address or length
ERR_UNKNOWN_COMMAND	8	//Unknown command
ERR_NOTBELEVEL3	9	//Internal error
ERR_READ	10	//Error reading data
ERR_WRITE	11	//Error writing data
ERR_RANDOM	12	//Random number error
ERR_SEED	13	//Seed error
ERR_CALCULATE	14	//Calculation error
ERR_NO_OPEN	15	//Dongle not opened before operation
ERR_OPEN_OVERFLOW	16	//Too many dongles opened (>16)
ERR_NOMORE	17	//No more dongle(s) can be found
ERR_NEED_FIND	18	//Use FindNext without Find
ERR_DECREASE	19	//Decrement error

ERR_AR_BADCOMMAND	20	//Algorithm command error
ERR_AR_UNKNOWN_OPCODE	21	//Algorithm operator error
ERR_AR_WRONGBEGIN	22	//The first command of algorithm contains a constant
ERR_AR_WRONG_END	23	//The last command of algorithm contains a constant
ERR_AR_VALUEOVERFLOW	24	//The value of the constant of the algorithm is greater than 63
ERR_TOOMUCHTHREAD	25	//The number of the threads that open a dongle in a process is greater than 100
ERR_RECEIVE_NULL	0x100	//Cannot receive
ERR_UNKNOWN_SYSTEM	0x102	//Unknown operating system
ERR_UNKNOWN	0xffff	//Unknown error

7.4 Basic Application Examples

FEITIAN offers several program examples to help beginners quickly familiarize themselves with ROCKEY. These sample programs are intentionally simplified to illustrate various security objectives and should not be construed as sufficient for most real world implementations. These samples are for demonstration purposes only. This document is not intended to illustrate how to take full advantage of the ROCKEY software protection system – that will depend on particularities of the developer, the application and the licensing objectives. Section 7.5 Advanced Application Examples are also a good reference but the developer will need to determine the best protection method given his own constraints and objectives.

Some key points that you need to pay attention to when programming:

- P3 and P4 are Advanced passwords enabling the developers to write to the dongles. Each of them should be set to a valid value only in this case. They should be set to 0 in the software delivered to end users.
- Be sure that none of the address parameters in the ROCKET4ND functions are Null pointers. For example, even if you do not require the Buffer, but it cannot be null, otherwise the result is unpredictable.

The following sample programs are written in VC 6.0. Let us discuss how to perform the required functions step by step from an original program. Software developers who develop software in other languages please do not skip this section. There are no special developing skills for the C language. Most software developers will understand the concepts illustrated here.

7.4.1 Original Program – Step 0

This program is the original program before it is protected with ROCKEY4ND.

```
#include <windows.h>

#include <stdio.h>

void main()
{
// Anyone begin from here.

        printf("Hello FeiTian!\n");

    }
```

7.4.2 Find Dongle – Step 1

We add an operation to find the ROCKEY at the beginning of the program. If the dongle is found the program will continue. If it is not found the program will exit.

```
#include <windows.h>

#include <stdio.h>
#include "Rockey4_ND_32.h"        // Include ROCKEY4ND Header File

void main()
{
    // ============================================================
    WORD retcode;
    WORD handle, p1, p2, p3, p4;
    DWORD lp1, lp2;
    BYTE buffer[1024];

    p1 = 0xc44c;
    p2 = 0xc8f8;
    p3 = 0;          // Program needn't Password3, Set to 0
    p4 = 0;          // Program needn't Password4, Set to 0

    // Try to find specified ROCKEY4ND
    retcode = Rockey(RY_FIND, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)     // Not found
    {

printf("ROCKEY not found!\n");
        return;
    }

    // ============================================================

        printf("Hello FeiTian!\n");
```

```
}
```

It is a very simple security objective. We only need to call the function "Find a ROCKEY dongle". You may refer to the introduction of the function "Find a ROCKEY dongle" in the section "ROCKEY4ND API Services".
For testing purposes you might try to run this program with and without the ROCKEY4ND dongle attached to the computer.

7.4.3 Open Dongle – Step 2

We add an operation to open ROCKEY with specified passwords at the beginning of the program. If the dongle can be opened the program continues. Otherwise, the program exits.

```
#include <windows.h>

#include <stdio.h>
#include "Rockey4_ND_32.h"        // Include ROCKEY4ND Header File

void main()
{
    // ============================================================
    WORD retcode;
    WORD handle, p1, p2, p3, p4;       // ROCKEY4ND Variable
    DWORD lp1, lp2;                    // ROCKEY4ND Variable
    BYTE buffer[1024];                 // ROCKEY4ND Variable

    p1 = 0xc44c;    // ROCKEY4ND Demo Password1
    p2 = 0xc8f8;    // ROCKEY4ND Demo Password2
    p3 = 0;         // Program needn't Password3, Set to 0
    p4 = 0;         // Program needn't Password4, Set to 0

    // Try to find specified Rockey
    retcode = Rockey(RY_FIND, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)    // Not found
    {
        printf("ROCKEY not found!\n");
        return;
    }

    retcode = Rockey(RY_OPEN, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)    // Error

{
        printf("Error Code: %d\n", retcode);
        return;
    }
```

```
    // ============================================================

    printf("Hello FeiTian!\n");


    retcode = Rockey(RY_CLOSE, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)
    {
        printf("Error Code: %d\n", retcode);
        return;
    }


    }
```

7.4.4 User Memory – Steps 3 and 4

Initialize ROCKEY with Editor or API. Write "Hello FEITIAN!" to the dongle and read it back from the dongle. See Step 3 and Step 4.

Initialize ROCKEY and write "Hello FEITIAN!" to it – **Step 3**:

```
#include <windows.h>

#include <stdio.h>

#include "Rockey4_ND_32.h"        // Include ROCKEY4ND Header File


void main()
{
    // ============================================================
    WORD retcode;
    WORD handle, p1, p2, p3, p4;        // ROCKEY4ND Variable
    DWORD lp1, lp2;                     // ROCKEY4ND Variable
    BYTE buffer[1024];                  // ROCKEY4ND Variable

    p1 = 0xc44c;    // ROCKEY4ND Demo Password1
    p2 = 0xc8f8;    // ROCKEY4ND Demo Password2
    p3 = 0;         // Program needn't Password3, Set to 0
    p4 = 0;         // Program needn't Password4, Set to 0

    // Try to find Rockey

retcode = Rockey(RY_FIND, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)      // Not found
    {
        printf("ROCKEY not found!\n");
```

```
        return;
    }


    retcode = Rockey(RY_OPEN, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)     // Error
    {
        printf("Error Code: %d\n", retcode);
        return;
    }


    p1 = 0;    // Pos
    p2 = 14;   // Length

    strcpy((char*)buffer, "Hello FeiTian! ");
    retcode = Rockey(RY_WRITE, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)     // Error
    {
        printf("Error Code: %d\n", retcode);
        return;
    }
      printf("Write: %s\n", buffer);


retcode = Rockey(RY_CLOSE, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)
    {
        printf("Error Code: %d\n", retcode);
        return;
    }


    }
```

In Step 3 we have written "Hello FEITIAN!" to the ROCKEY dongle. In Step 4 we will read the contents of the dongle.

Read dongle contents – **Step 4**:

```
#include <windows.h>

#include <stdio.h>
#include "Rockey4_ND_32.h"        // Include ROCKEY4ND Header File

void main()
{
```

```
    // ============================================================
    WORD retcode;
    WORD handle, p1, p2, p3, p4;       // ROCKEY4ND Variable
    DWORD lp1, lp2;                    // ROCKEY4ND Variable
    BYTE buffer[1024];                 // ROCKEY4ND Variable

    p1 = 0xc44c;   // ROCKEY4ND Demo Password1
    p2 = 0xc8f8;   // ROCKEY4ND Demo Password2
    p3 = 0;        // Program needn't Password3, Set to 0
    p4 = 0;        // Program needn't Password4, Set to 0

    // Try to find specified Rockey
    retcode = Rockey(RY_FIND, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)     // Not found
    {
        printf("ROCKEY not found!\n");
        return;
    }

    retcode = Rockey(RY_OPEN, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)     // Error
    {
        printf("Error Code: %d\n", retcode);
        return;
    }

    p1 = 0;    // Pos
    p2 = 14;   // Length

    buffer[14] = 0;
    retcode = Rockey(RY_READ, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)     // Error
    {
        printf("Error Code: %d\n", retcode);
        return;
    }


// ============================================================
    printf("%s\n", buffer);

        retcode = Rockey(RY_CLOSE, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)
    {
```

```
            printf("Error Code: %d\n", retcode);
            return;
            }
      }
```

7.4.5 Generate a true random number with ROCKEY – Step 5

Generate a random number when the program starts and write this random number to the dongle. The program should check if the random number is correct during run-time. If a sharing device is installed to this computer, and someone else runs this program also from another computer, another random number will be generated and written to the dongle. Thus the program on the first computer will be terminated since the random number is not correct.

```
#include <windows.h>
#include <stdio.h>
#include "Rockey4_ND_32.h"        // Include ROCKEY4ND Header File

void main()
{
      // ============================================================
      WORD retcode;
      WORD handle, p1, p2, p3, p4;       // ROCKEY4ND Variable
      DWORD lp1, lp2;                    // ROCKEY4ND Variable
      BYTE buffer[1024];                 // ROCKEY4ND Variable

      p1 = 0xc44c;    // ROCKEY4ND Demo Password1
      p2 = 0xc8f8;    // ROCKEY4ND Demo Password2
      p3 = 0;         // Program needn't Password3, Set to 0
      p4 = 0;         // Program needn't Password4, Set to 0

      // Try to find specified Rockey
      retcode = Rockey(RY_FIND, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
      if (retcode)     // Not found
      {
            printf("ROCKEY not found!\n");
            return;
      }



      retcode = Rockey(RY_OPEN, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);

if (retcode)     // Error
```

```
	{
		printf("Error Code: %d\n", retcode);
		return;
	}


retcode = Rockey(RY_RANDOM, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)	// Error
	{
		printf("Error Code: %d\n", retcode);
		return;
	}
	  printf("Random:%04X,%04X,%04X,%04X\n", p1,p2,p3,p4);


sprintf(buffer, "%04X", p1);
p1 = 0;	// Pos
p2 = 4;	// Length
p3 = 1;
	retcode = Rockey(RY_WRITE, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)	// Error
	{
		printf("Error Code: %d\n", retcode);
		return;
	}
printf("Write: %s\n", buffer);


p1 = 0;	// Pos
	p2 = 4;	// Length

	buffer[4] = 0;
	retcode = Rockey(RY_READ, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)	// Error
	{
		printf("Error Code: %d\n", retcode);
		return;
	}
printf("Read: %s\n", buffer);


 if(buffer)

		printf("Hello FeiTian!\n");
```

```
else

  exit(0);

retcode = Rockey(RY_CLOSE, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
                printf("Error Code: %d\n", retcode);
                return;

                }

}
```

7.4.6 Seed – Steps 6 and 7

Read the seed code return values with the Editor or API. The seed code calculation is performed inside the dongle and the algorithm is confidential. You may verify the return codes or use the return codes in an encryption routine. See Step 6 and Step 7.

Read the return codes of fixed seed code (0x12345678) - **Step 6**:

```
#include <windows.h>

#include <stdio.h>

#include "Rockey4_ND_32.h"        // Include ROCKEY4ND Header File

void main()
{
        WORD retcode;
        WORD handle, p1, p2, p3, p4;        // ROCKEY4ND Variable
        DWORD lp1, lp2;                     // ROCKEY4ND Variable
        BYTE buffer[1024];                  // ROCKEY4ND Variable


p1 = 0xc44c;    // ROCKEY4ND Demo Password1
p2 = 0xc8f8;    // ROCKEY4ND Demo Password2
        p3 = 0;             // Program needn't Password3, Set to 0
        p4 = 0;             // Program needn't Password4, Set to 0

        // Try to find specified Rockey
        retcode = Rockey(RY_FIND, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)      // Not found
        {
                printf("ROCKEY not found!\n");

                return;
```

```
	}


retcode = Rockey(RY_OPEN, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)	// Error
	{
		printf("Error Code: %d\n", retcode);
		return;
	}

	//seed Rockey
	lp2 = 0x12345678;
	retcode = Rockey(RY_SEED, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)	// Error
	{
		printf("Error Code: %d\n", retcode);
		return;
	}

printf("Seed: %04X %04X %04X %04X\n", p1, p2, p3, p4);

// Close Rockey
	retcode = Rockey(RY_CLOSE, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)
	{
		printf("Error Code: %d\n", retcode);
		return;
	}
printf("\n");

			getch();

	}
```

Verify the return codes of the seed code to see if the program should be terminated - **Step 7**:

```
	#include <windows.h>

#include <stdio.h>
#include "Rockey4_ND_32.h"		// Include ROCKEY4ND Header File

void main()
{
	WORD retcode;

	WORD handle, p1, p2, p3, p4;		// ROCKEY4ND Variable
```

```
        DWORD lp1, lp2;                 // ROCKEY4ND Variable
        BYTE buffer[1024];              // ROCKEY4ND Variable


p1 = 0xc44c;    // ROCKEY4ND Demo Password1
        p2 = 0xc8f8;    // ROCKEY4ND Demo Password2
        p3 = 0;         // Program needn't Password3, Set to 0
        p4 = 0;         // Program needn't Password4, Set to 0


// Try to find specified Rockey
        retcode = Rockey(RY_FIND, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)    // Not found
        {
                printf("ROCKEY not found!\n");
                return;
        }


retcode = Rockey(RY_OPEN, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)    // Error
        {
                printf("Error Code: %d\n", retcode);
                return;
        }


//seed Rockey
        lp2 = 0x12345678;
        retcode = Rockey(RY_SEED, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)    // Error
        {
                printf("Error Code: %d\n", retcode);
                return;
        }


if (p1==0xD03A && p2==0x94D6 && p3==0x96A9 && p4==0x7F54)
                printf("Hello FeiTian!\n");
else
{
printf("Hello error!\n");

return;
```

```
}

// Close Rockey
	retcode = Rockey(RY_CLOSE, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);

if (retcode)
	{
		printf("Error Code: %d\n", retcode);
		return;
	}
}
```

7.4.7 User ID – Steps 8 and 9

Write the User ID to the dongle with the Editor or API. User ID may be a software version or product type and it may also be used in some encryption schemes. See Step 8 and Step 9.

Note: Advanced passwords are needed for Step 8.

Initialize ROCKEY and write User ID to the dongle. See **Step 8**:

```
#include <windows.h>

#include <stdio.h>

#include "Rockey4_ND_32.h"		// Include ROCKEY4ND Header File

void main()
{
	// ============================================================
	WORD retcode;
	WORD handle, p1, p2, p3, p4;		// ROCKEY4ND Variable
	DWORD lp1, lp2;				// ROCKEY4ND Variable
	BYTE buffer[1024];			// ROCKEY4ND Variable

	p1 = 0xc44c;	// ROCKEY4ND Demo Password1
	p2 = 0xc8f8;	// ROCKEY4ND Demo Password2
	p3 = 0x0799;	// ROCKEY4ND Demo Password3
	p4 = 0xc43b;	// ROCKEY4ND Demo Password4


// Try to find specified Rockey
	retcode = Rockey(RY_FIND, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)	// Not found
	{

		printf("ROCKEY not found!\n");
```

```
            return;
        }


retcode = Rockey(RY_OPEN, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);

if (retcode)      // Error
        {
            printf("Error Code: %d\n", retcode);
            return;
        }


lp1 = 0x88888888;
retcode = Rockey(RY_WRITE_USERID, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode) // Error
        {
            printf("Error Code: %d\n", retcode);
            return;
        }
            printf("Write User ID: %08X\n", lp1);


        retcode = Rockey(RY_CLOSE, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            printf("Error Code: %d\n", retcode);
            return;
        }


        }
```

Verify the User ID. If the User ID is not 0x88888888 output "Hello DEMO!". See **Step 9**:

```
#include <windows.h>

#include <stdio.h>

#include "Rockey4_ND_32.h"        // Include ROCKEY4ND Header File

void main()
{
        // ============================================================

        WORD retcode;
```

```
	WORD handle, p1, p2, p3, p4;	// ROCKEY4ND Variable
	DWORD lp1, lp2;			// ROCKEY4ND Variable
	BYTE buffer[1024];		// ROCKEY4ND Variable

	p1 = 0xc44c;	// ROCKEY4ND Demo Password1
	p2 = 0xc8f8;	// ROCKEY4ND Demo Password2

p3 = 0;		// Program needn't Password3, Set to 0
	p4 = 0;		// Program needn't Password4, Set to 0


	// Try to find specified Rockey
	retcode = Rockey(RY_FIND, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)	// Not found
	{
		printf("ROCKEY not found!\n");
		return;
	}

	retcode = Rockey(RY_OPEN, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)	// Error
	{
		printf("Error Code: %d\n", retcode);
		return;
	}

lp1 = 0;
retcode = Rockey(RY_READ_USERID, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
if (retcode) // Error
	{
		printf("Error Code: %d\n", retcode);
		return;
	}
	if (lp1==0x88888888)
		printf("Hello FeiTian!\n");
		else
		{
printf("Hello DEMO!\n");
return;
}
	retcode = Rockey(RY_CLOSE, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)

{
```

```
        printf("Error Code: %d\n", retcode);
        return;
    }

    }
```

7.4.8 Module – Steps 10, 11, and 12

Set module value and attributes with Editor or API then check if the module is allowed to be used. Determine whether to activate the associated application module. The module value may also be used by the program. Check if the module is allowed to be decreased to limit the number of software executions. See Step 10, Step 11 and Step 12.

Note: Advanced passwords are needed for Step 10.

Initialize ROCKEY and set module value. For example we set module 0 to be valid and its value cannot be decreased. See **Step 10**:

```
#include <windows.h>

#include <stdio.h>

#include "Rockey4_ND_32.h"        // Include ROCKEY4ND Header File

void main()
{
    // ============================================================
    WORD retcode;
    WORD handle, p1, p2, p3, p4;       // ROCKEY4ND Variable
    DWORD lp1, lp2;                    // ROCKEY4ND Variable
    BYTE buffer[1024];                 // ROCKEY4ND Variable

    p1 = 0xc44c;    // ROCKEY4ND Demo Password1
    p2 = 0xc8f8;    // ROCKEY4ND Demo Password2
    p3 = 0x0799;    // ROCKEY4ND Demo Password3
    p4 = 0xc43b;    // ROCKEY4ND Demo Password4

    // Try to find specified Rockey
    retcode = Rockey(RY_FIND, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)      // Not found
    {
        printf("ROCKEY not found!\n");
        return;
    }
```

```
retcode = Rockey(RY_OPEN, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)	// Error
	{
		printf("Error Code: %d\n", retcode);
		return;
	}

	p1 = 0;
	p2 = 3;
	p3 = 0;
	retcode = Rockey(RY_SET_MOUDLE, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)
	{
		printf("Error Code: %d\n", retcode);
		return;
	}
		printf("Set Moudle 0: Pass = %04X Decrease no allow\n", p2);


retcode = Rockey(RY_CLOSE, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)
	{
		printf("Error Code: %d\n", retcode);
		return;
	}


	}
```

If module 0 is valid in the program, output "Hello FEITIAN!". Otherwise terminate or exit the program. See **Step 11**:

```
	#include <windows.h>

#include <stdio.h>
#include "Rockey4_ND_32.h"		// Include ROCKEY4ND Header File

void main()
{
	// ============================================================
	WORD retcode;
	WORD handle, p1, p2, p3, p4;		// ROCKEY4ND Variable
	DWORD lp1, lp2;			// ROCKEY4ND Variable

	BYTE buffer[1024];			// ROCKEY4ND Variable
```

```
	p1 = 0xc44c;	// ROCKEY4ND Demo Password1
	p2 = 0xc8f8;	// ROCKEY4ND Demo Password2
	p3 = 0;		// Program needn't Password3, Set to 0
	p4 = 0;		// Program needn't Password4, Set to 0


// Try to find specified Rockey
	retcode = Rockey(RY_FIND, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)	// Not found
	{
		printf("ROCKEY not found!\n");
		return;
	}


retcode = Rockey(RY_OPEN, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)	// Error
	{
		printf("Error Code: %d\n", retcode);
		return;
	}


p1 = 0;
	retcode = Rockey(RY_CHECK_MOUDLE, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)
	{
		printf("Error Code: %d\n", retcode);
		return;
	}

if (p2)
		printf("Hello FeiTian!\n");
else
	 return;


retcode = Rockey(RY_CLOSE, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)

{

		printf("Error Code: %d\n", retcode);
		return;
```

```
        }
    }
```

In Step 10 we set p2=3(allowed software run times) and p3=1(Decrement allowed). That is to say module 0(p1=0) sets the maximum software run time to 3. See **Step 12**:

```
#include <windows.h>
#include <stdio.h>
#include "Rockey4_ND_32.h"        // Include ROCKEY4ND Header File

void main()
{
    // ============================================================
    WORD retcode;
    WORD handle, p1, p2, p3, p4;       // ROCKEY4ND Variable
    DWORD lp1, lp2;                    // ROCKEY4ND Variable
    BYTE buffer[1024];                 // ROCKEY4ND Variable

    p1 = 0xc44c;    // ROCKEY4ND Demo Password1
    p2 = 0xc8f8;    // ROCKEY4ND Demo Password2
    p3 = 0;         // Program needn't Password3, Set to 0
    p4 = 0;         // Program needn't Password4, Set to 0


// Try to find specified Rockey
    retcode = Rockey(RY_FIND, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)     // Not found
    {
        printf("ROCKEY not found!\n");
        return;
    }


retcode = Rockey(RY_OPEN, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)     // Error
    {
        printf("Error Code: %d\n", retcode);
        return;


}
p1 = 0;
    retcode = Rockey(RY_CHECK_MOUDLE, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
```

```
	if (retcode)
	{
		printf("Error Code: %d\n", retcode);
		return;
	}

if (p2!=1)
{
	printf("Update Please!\n");
return;
}

if(p3==1)
{
	 p1=0;
	 retcode = Rockey(RY_DECREASE, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	 if(retcode)
		{
				printf("Error Code: %d\n", retcode);
				return;
	}

}


// ============================================================

	printf("Hello FeiTian!\n");

retcode = Rockey(RY_CLOSE, &handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)

{
		printf("Error Code: %d\n", retcode);
		return;
	}

	}
```

7.4.9 Collaboration – Step 13

Multi ROCKEY dongles with the same passwords may work on the same computer no matter whether the dongle types are the same or not. The program can distinguish the dongles because every dongle has a unique hardware ID. See **Step 13**:

```
#include <windows.h>

#include <stdio.h>

#include "Rockey4_ND_32.h"        // Include ROCKEY4ND Header File


void main()
{
int i, rynum;
WORD retcode;
WORD handle[16], p1, p2, p3, p4; // ROCKEY4ND Variable
DWORD lp1, lp2;                  // ROCKEY4ND Variable
BYTE buffer[1024];               // ROCKEY4ND Variable

p1 = 0xc44c;    // ROCKEY4ND Demo Password1
p2 = 0xc8f8;    // ROCKEY4ND Demo Password2
p3 = 0;         // Program needn't Password3, Set to 0
p4 = 0;         // Program needn't Password4, Set to 0

// Try to find all Rockey
for (i=0;i<16;i++)
{
      if (0 == i)
      {
retcode = Rockey(RY_FIND, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
if (retcode == ERR_NOMORE)
break;
      }
      else
      {
        // Notice : lp1 = Last found hardID
        retcode = Rockey(RY_FIND_NEXT, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
            if (retcode == ERR_NOMORE)
break;
            }

            if (retcode)      // Error
            {
                  printf("Error Code: %d\n", retcode);

                  return;
            }

            printf("Found Rockey: %08X    ", lp1);
```

```
            retcode = Rockey(RY_OPEN, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
            if (retcode)      // Error
            {
                  printf("Error Code: %d\n", retcode);

return;
            }

      }
      printf("\n");

      rynum = i;

      // Do our work
      for (i=0;i<rynum;i++)
      {
            // Read Rockey user memory
            p1 = 0;     // Pos
            p2 = 12;   // Length

            buffer[12] = 0;
            retcode = Rockey(RY_READ, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
            if (retcode)      // Error
            {

                  printf("Error Code: %d\n", retcode);
                  return;
            }
            printf("%s\n", buffer);           // Output


lp1=0;
retcode = Rockey(RY_READ_USERID, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
            if (retcode)      // Error
            {
                  printf("Error Code: %d\n", retcode);
                  return;
            }
            printf("Read User ID: %08X\n", lp1);


   p1=0;
```

```
retcode = Rockey(RY_CHECK_MOUDLE, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
            if (retcode)      // Error
            {
                  printf("Error Code: %d\n", retcode);
                  return;
            }

            printf("Check Moudle 0: ");
            if (p2)
printf("Allow      ");
            else
printf("No Allow      ");
            if (p3)

printf("Allow Decrease\n");
            else
printf("Not Allow Decrease\n");

}

      // Close all opened Rockey
      for (i=0;i<rynum;i++)
      {
            retcode = Rockey(RY_CLOSE, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
            if (retcode)

            {
                  printf("Error Code: %d\n", retcode);
                  return;
            }

            }

      }
```

A maximum of 16 dongles may be attached to the same computer at the same time. The program can access any dongle you specify.

In the above program we defined a handle array to save the opened ROCKEY handle to prepare for the next operation on the specified dongle. When we find the dongle we open it and we close all opened ROCKEY handles before exiting the program. Developers are better off operating in this manner, but for a large program it is OK to open/close the dongle just once at the beginning/end of the program. Frequent open and close operations will reduce performance. We open the dongle in share mode so that other programs may also simultaneously operate with the dongle.

You can find the source code of the samples above from the CD-ROM or under *Samples* directory.

Note: We called function RY_OPEN and RY_CLOSE in the above program. We must open ROCKEY before all operations with the exceptions of RY_FIND and RY_FIND_NEXT. This is similar to the operation on the disk files. You should close the dongle immediately after finishing dongle related operations.

7.5 Advanced Application Examples

This section is dedicated to providing additional illustrative examples of methods you may employ to protect your software with ROCKEY4ND. These examples are intentionally simplified and not intended to be a complete solutions for software protection. The method appropriate for your application will depend on constraints set by your licensing agreement and other factors. (If you are familiar with the API call already, you may skip to Chapter 8 ROCKEY4ND Hardware Algorithms.)

7.5.1 User Data Zone advanced application

In **Step 14** we will write "Hello FEITIAN!" to User Data Zone (UDZ). In general we would write "Hello FEITIAN!" to the UDZ as one character string, but security may be enhanced by writing it in two parts and then later combining the character strings.

```
#include <windows.h>

#include <stdio.h>

#include <conio.h>
#include "Rockey4_ND_32.h"

void ShowERR(WORD retcode)
{
	if (retcode == 0) return;
	printf("Error Code: %d\n", retcode);
}

void main()
{
	WORD handle[16], p1, p2, p3, p4, retcode;
	DWORD lp1, lp2;
	BYTE buffer[1024];
	BYTE buf[1024];

	int i, j;



	p1 = 0xc44c;
	p2 = 0xc8f8;
	p3 = 0;
	p4 = 0;
```

```
retcode = Rockey(RY_FIND, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);

if (retcode)
{
	ShowERR(retcode);
	return;
}
printf("Find Rock: %08X\n", lp1);


retcode = Rockey(RY_OPEN, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
if (retcode)
{

	ShowERR(retcode);
	return;
}

i = 1;
while (retcode == 0)
{
	retcode = Rockey(RY_FIND_NEXT, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode == ERR_NOMORE) break;
	if (retcode)
	{
		ShowERR(retcode);
		return;
	}


	retcode = Rockey(RY_OPEN, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)
	{
		ShowERR(retcode);
		return;
	}

	i++;
	printf("Find Rock: %08X\n", lp1);
}
printf("\n");

for (j=0;j<i;j++)
```

```
{

    p1 = 0;
    p2 = 10;
      p3 = 1;
    strcpy((char*)buffer, "Hello ");
    retcode = Rockey(RY_WRITE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)
    {

        ShowERR(retcode);
        return;
    }
    printf("Write: Hello \n");


    p1 = 12;
    p2 = 12;
      p3 = 1;
    strcpy((char*)buffer, "FeiTian!");
    retcode = Rockey(RY_WRITE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)
    {
        ShowERR(retcode);
        return;
    }
    printf("Write: FeiTian!\n");


    p1 = 0;
    p2 = 10;

    memset(buffer, 0, 64);
    retcode = Rockey(RY_READ, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)
    {

        ShowERR(retcode);
        return;
    }
    printf("Read: %s\n", buffer);


    p1 = 12;
```

```
        p2 = 12;

        memset(buf, 0, 64);
        retcode = Rockey(RY_READ, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buf);
        if (retcode)

        {
            ShowERR(retcode);
            return;
        }
        printf("Read: %s\n", buf);

        printf("\n");
        printf("%s\n", strcat(buffer,buf));



        retcode = Rockey(RY_CLOSE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)

        {
            ShowERR(retcode);
            return;
        }

        getch();
    }

    }
```

Step 15: You may write a serial number in the User Data Zone (UDZ) and then verify it during run time as a means of protecting and controlling a program module.

```
#include <windows.h>

#include <stdio.h>

#include <conio.h>
#include "Rockey4_ND_32.h"

void ShowERR(WORD retcode)
{
    if (retcode == 0) return;
    printf("Error Code: %d\n", retcode);
}
```

```
void main()
{

	WORD handle[16], p1, p2, p3, p4, retcode;
	DWORD lp1, lp2;
	BYTE buffer[1024];

	int i, j;


	p1 = 0xc44c;
	p2 = 0xc8f8;
	p3 = 0x0799;
	p4 = 0xc43b;

	retcode = Rockey(RY_FIND, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)

	{
		ShowERR(retcode);
		return;
	}
	printf("Find Rock: %08X\n", lp1);


retcode = Rockey(RY_OPEN, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)
	{
		ShowERR(retcode);
		return;
	}

	i = 1;
	while (retcode == 0)
	{
		retcode = Rockey(RY_FIND_NEXT, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
		if (retcode == ERR_NOMORE) break;
		if (retcode)
		{
			ShowERR(retcode);
			return;
		}
```

```
        retcode = Rockey(RY_OPEN, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);

                if (retcode)
                {
                        ShowERR(retcode);
                        return;
                }

                i++;
                printf("Find Rock: %08X\n", lp1);
        }
        printf("\n");


        for (j=0;j<i;j++)
        {
                p1 = 0;

                p2 = 12;
                  p3 = 1;
                strcpy((char*)buffer, "a1b2c3d4e5f6");

retcode = Rockey(RY_WRITE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
                if (retcode)
                {
                        ShowERR(retcode);
                        return;
                }
                printf("Write:a1b2c3d4e5f6\n");


                p1 = 0;
                p2 = 2;

                memset(buffer, 0, 64);
                retcode = Rockey(RY_READ, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
                if (retcode)
                {
                        ShowERR(retcode);
                        return;
                }
                printf("Read: %s\n", buffer);
```

```
        if (!strcmp(buffer,"a1"))
            printf("Run Module 1\n");
        else

            break;

        p1 = 2;
        p2 = 2;

        memset(buffer, 0, 64);
        retcode = Rockey(RY_READ, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;

        }
        printf("Read: %s\n", buffer);



        if (!strcmp(buffer,"b2"))
            printf("Run Module 2\n");
        else
            break;


        retcode = Rockey(RY_CLOSE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }

        printf("\n");
        getch();

    }

    }
```

Step 16: Write a number to the UDZ and decrease it during run time as a means of controlling a software module. We recommend you use the encryption idea in Step 12 combined with Step 16.

```
#include <windows.h>
```

```
#include <stdio.h>
#include <conio.h>
#include "Rockey4_ND_32.h"

void ShowERR(WORD retcode)
{
	if (retcode == 0) return;
	printf("Error Code: %d\n", retcode);
}

void main()
{

	WORD handle[16], p1, p2, p3, p4, retcode;

	DWORD lp1, lp2;
	BYTE buffer[1024];


	int i, j,num;

	p1 = 0xc44c;
	p2 = 0xc8f8;
	p3 = 0;
	p4 = 0;


	{

	retcode = Rockey(RY_FIND, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)
	{
		ShowERR(retcode);
		return;
	}
	printf("Find Rock: %08X\n", lp1);


	retcode = Rockey(RY_OPEN, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)
	{
		ShowERR(retcode);

		return;
```

```
}

i = 1;
while (retcode == 0)
{
	retcode = Rockey(RY_FIND_NEXT, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode == ERR_NOMORE) break;
	if (retcode)
	{
		ShowERR(retcode);
		return;
	}

	retcode = Rockey(RY_OPEN, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);

	if (retcode)
	{
		ShowERR(retcode);

		return;
	}


	i++;
	printf("Find Rock: %08X\n", lp1);
}
printf("\n");

for (j=0;j<i;j++)
{
	p1 = 0;
	p2 = 2;
	  p3 = 1;
	strcpy((char*)buffer, "03");
	retcode = Rockey(RY_WRITE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)
	{
		ShowERR(retcode);
		return;
	}
	printf("Write: 03\n");
	p1 = 0;
	p2 = 1;
	memset(buffer, 0, 64);
```

```
        retcode = Rockey(RY_READ, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Read: %s\n", buffer);

        num=atoi(buffer);

        if(num)
        {
          printf("Hello FeiTian!\n");
            num--;
        }
        else
        {
            return;
        }
        p1 = 0;
        p2 = 1;
        sprintf(buffer, "%ld", num);
        retcode = Rockey(RY_WRITE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Write: %ld\n",num);

        retcode = Rockey(RY_CLOSE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("\n");

        }
    }

    }
```

7.5.2 Seed code advanced applications

Step 17: You may use different seed codes for different software modules or in different places in the application. Then verify the seed codes in the applications.

```
#include <windows.h>

#include <stdio.h>
#include <conio.h>
#include "Rockey4_ND_32.h"

void ShowERR(WORD retcode)
{
	if (retcode == 0) return;

	printf("Error Code: %d\n", retcode);
}

void main()
{

	WORD handle[16], p1, p2, p3, p4, retcode;
	DWORD lp1, lp2;
	BYTE buffer[1024];

	int i, j;

	p1 = 0xc44c;
	p2 = 0xc8f8;
	p3 = 0;
	p4 = 0;

	retcode = Rockey(RY_FIND, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)
	{
		ShowERR(retcode);
		return;
	}
	printf("Find Rock: %08X\n", lp1);

	retcode = Rockey(RY_OPEN, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)
	{

		ShowERR(retcode);
		return;
	}
```

```
i = 1;
while (retcode == 0)
{
	retcode = Rockey(RY_FIND_NEXT, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode == ERR_NOMORE) break;
	if (retcode)
	{
		ShowERR(retcode);
		return;
	}

	retcode = Rockey(RY_OPEN, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);

	if (retcode)
	{
		ShowERR(retcode);
		return;

	}

	i++;
	printf("Find Rock: %08X\n", lp1);
}
printf("\n");


for (j=0;j<i;j++)
{

	lp2 = 0x12345678;
	retcode = Rockey(RY_SEED, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)
	{
		ShowERR(retcode);
		return;
	}
	printf("Seed: %04X %04X %04X %04X\n", p1, p2, p3, p4);


		if(p1==0xD03A && p2==0x94D6 && p3==0x96A9 && p4==0x7F54)
		   printf("Hello Fei!\n");
	else
		break;
```

```
            lp2 = 0x87654321;
        retcode = Rockey(RY_SEED, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Seed: %04X %04X %04X %04X\n", p1, p2, p3, p4);

        if(p1==0xB584 && p2==0xD64F && p3==0xC885 && p4==0x5BA0)
printf("Hello Tian!\n");
        else
        break;

lp2 = 0x18273645;
        retcode = Rockey(RY_SEED, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Seed: %04X %04X %04X %04X\n", p1, p2, p3, p4);

        if(p1==0x2F6D && p2==0x27F8 && p3==0xB3EE && p4==0xBE5A)
              printf("Hello OK!\n");
        else
             break;

        retcode = Rockey(RY_CLOSE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("\n");
        getch();
    }


}
```

In **Step 18** we use four outputs of the seed code function to encrypt and decrypt a character string. Be sure you only include the "decrypt" portion of the code in the application version that is sent to end users.

```
#include <windows.h>
```

```
#include <stdio.h>
#include <conio.h>
#include "Rockey4_ND_32.h"

void ShowERR(WORD retcode)
{
	if (retcode == 0) return;
	printf("Error Code: %d\n", retcode);
}

void main()

{
	char str[20] = "Hello FeiTian!";
	DWORD mykey = 12345678;
	int n, slen;

	WORD handle[16], p1, p2, p3, p4, retcode;
	DWORD lp1, lp2;
	BYTE buffer[1024];

	int	i,j;

	p1 = 0xc44c;
	p2 = 0xc8f8;
	p3 = 0x0799;
	p4 = 0xc43b;

	retcode = Rockey(RY_FIND, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)
	{
		ShowERR(retcode);
		return;
	}
	printf("Find Rock: %08X\n", lp1);

	retcode = Rockey(RY_OPEN, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)
	{
		ShowERR(retcode);
		return;
	}

	i = 1;
```

```
    while (retcode == 0)
    {
        retcode = Rockey(RY_FIND_NEXT, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode == ERR_NOMORE) break;
        if (retcode)

        {
            ShowERR(retcode);
            return;
        }

        retcode = Rockey(RY_OPEN, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }

        i++;
        printf("Find Rock: %08X\n", lp1);
    }
    printf("\n");

    for (j=0;j<i;j++)
    {
          // Encrypt my data
        slen = strlen(str);
            lp2 = mykey;
          retcode = Rockey(RY_SEED, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)      // Error
        {
        printf("Error Code: %d\n", retcode);
        return;
        }

        for (n=0;n<slen;n++)
        {
        str[n] = str[n] + (char)p1 + (char)p2 + (char)p3 + (char)p4;
        }

printf("Encrypted data is %s\n", str);

        // Decrypt my data
        lp2 = mykey;
```

```
            retcode = Rockey(RY_SEED, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
            if (retcode)      // Error
            {
            printf("Error Code: %d\n", retcode);
            return;

            }

            for (n=0;n<slen;n++)
            {
            str[n] = str[n] - (char)p1 - (char)p2 - (char)p3 - (char)p4;
            }
            printf("Decrypted data is %s\n", str);


            retcode = Rockey(RY_CLOSE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
            if (retcode)
            {
                  ShowERR(retcode);
                  return;
            }

            printf("\n");
            getch();
      }


}
```

7.5.3 User ID advanced applications

Step 19: Some developers will write the current date to the UID when initializing the dongles. During runtime the software may compare the current system time with the date stored in the UID. The program would take appropriate actions or continue based on the results of the comparison.

```
#include <windows.h>

#include <stdio.h>
#include <conio.h>
#include "Rockey4_ND_32.h"

void ShowERR(WORD retcode)
{
      if (retcode == 0) return;
      printf("Error Code: %d\n", retcode);
}
```

```
void main()
{

	WORD handle[16], p1, p2, p3, p4, retcode;
	DWORD lp1, lp2;
	BYTE buffer[1024];
	  BYTE buf[1024];

	int i, j;

	SYSTEMTIME st;


	p1 = 0xc44c;
	p2 = 0xc8f8;
	p3 = 0x0799;
	p4 = 0xc43b;

	retcode = Rockey(RY_FIND, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)
	{

		ShowERR(retcode);
		return;
	}
	printf("Find Rock: %08X\n", lp1);
	retcode = Rockey(RY_OPEN, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);

if (retcode)
	{

		ShowERR(retcode);
		return;
	}

	i = 1;
	while (retcode == 0)
	{
		retcode = Rockey(RY_FIND_NEXT, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
		if (retcode == ERR_NOMORE) break;
		if (retcode)
		{
			ShowERR(retcode);
```

```
            return;
        }


        retcode = Rockey(RY_OPEN, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }

        i++;
        printf("Find Rock: %08X\n", lp1);
    }
    printf("\n");


    for (j=0;j<i;j++)
    {

        lp1 = 0x20021101;
        retcode = Rockey(RY_WRITE_USERID, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
        return;
        }

        printf("Write User ID: %08X\n", lp1);


lp1 = 0;
        retcode = Rockey(RY_READ_USERID, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Read User ID: %08X\n", lp1);


sprintf(buffer,"%08X",lp1);
        GetLocalTime(&st);
        printf("Date:%04d%02d%02d\n",st.wYear,st.wMonth,st.wDay);
```

```
sprintf(buf,"%04d%02d%02d",st.wYear,st.wMonth,st.wDay);
            if(strcmp(buf,buffer)>=0)
            {
                printf("ok!\n");
            }
            else

                break;

           retcode = Rockey(RY_CLOSE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
            if (retcode)
            {
                ShowERR(retcode);
                return;
            }

            printf("\n");
            getch();

    }

    }
```

7.5.4 Module advanced applications

Step 20: Module encryption allows you to selectively control portions of your application with the ROCKEY4ND modules.

```
#include <windows.h>

#include <stdio.h>
#include <conio.h>
#include "Rockey4_ND_32.h"

void ShowERR(WORD retcode)
{
    if (retcode == 0) return;
    printf("Error Code: %d\n", retcode);
}
void main()
{
    WORD handle[16], p1, p2, p3, p4, retcode;

    DWORD lp1, lp2;
    BYTE buffer[1024];
```

```
int i, j;

p1 = 0xc44c;
p2 = 0xc8f8;
p3 = 0x0799;
p4 = 0xc43b;

{
retcode = Rockey(RY_FIND, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
if (retcode)
{
	ShowERR(retcode);
	return;
}
printf("Find Rock: %08X\n", lp1);

retcode = Rockey(RY_OPEN, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
if (retcode)
{
	ShowERR(retcode);

	return;
}

i = 1;
while (retcode == 0)
{
	retcode = Rockey(RY_FIND_NEXT, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode == ERR_NOMORE) break;
	if (retcode)
	{
		ShowERR(retcode);
		return;
	}

	retcode = Rockey(RY_OPEN, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)

	{
		ShowERR(retcode);
		return;
	}
```

```
        i++;
        printf("Find Rock: %08X\n", lp1);
    }
    printf("\n");

    for (j=0;j<i;j++)
    {
          p1 = 0;
        p2 = 0x2121;
        p3 = 0;
        retcode = Rockey(RY_SET_MOUDLE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Set Moudle 0: Pass = %04X Decrease no allow\n", p2);

        p1 = 0;

        retcode = Rockey(RY_CHECK_MOUDLE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);

        if (retcode)

        {
            ShowERR(retcode);
            return;
        }
        printf("Check Moudle 0: ");
        if (p2)
            printf("Run Modul 1!\n");
        else
            break;

        printf("\n");


        p1 = 8;
        p2 = 0xFFFF;

        p3 = 0;
        retcode = Rockey(RY_SET_MOUDLE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
```

```
            ShowERR(retcode);
            return;
        }
        printf("Set Moudle 8: Pass = %04X Decrease no allow\n", p2);


        p1 = 8;
        retcode = Rockey(RY_CHECK_MOUDLE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {

            ShowERR(retcode);
            return;
        }
        printf("Check Moudle 8: ");
        if (p2)
            printf("Run Modul 2!");
        else
            break;

        retcode = Rockey(RY_CLOSE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }

        printf("\n");

        }
    }

    }
```

Step 21: This program discussed how to perform multi-module encryption and check the status of the modules. Many applications are segmented into program modules that users may choose or purchase separately. For example, a user may purchase three of four available application modules and the licensing policy would allow the user to execute only those modules that were purchased. ROCKEY4ND modules may be used to enforce this licensing scheme.

```
#include <windows.h>

#include <stdio.h>
#include "Rockey4_ND_32.h"        // Include ROCKEY4ND Header File

void main()
```

```
{
int i, j, rynum;
WORD retcode;
DWORD HID[16];

WORD handle[16], p1, p2, p3, p4; // ROCKEY4ND Variable
DWORD lp1, lp2;                  // ROCKEY4ND Variable
BYTE buffer[1024];               // ROCKEY4ND Variable

p1 = 0xc44c;   // ROCKEY4ND Demo Password1

p2 = 0xc8f8;   // ROCKEY4ND Demo Password2
p3 = 0;        // Program needn't Password3, Set to 0
p4 = 0;        // Program needn't Password4, Set to 0

// Try to find all Rockey
for (i=0;i<16;i++)
{
if (0 == i)
{
retcode = Rockey(RY_FIND, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
      if (retcode == ERR_NOMORE) break;
    }
    else
    {
      // Notice : lp1 = Last found hardID
      retcode = Rockey(RY_FIND_NEXT, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
if (retcode == ERR_NOMORE) break;

    }

if (retcode)   // Error
{
      printf("Error Code: %d\n", retcode);
      return;
    }

    printf("Found Rockey: %08X\n", lp1);
    HID[i] = lp1;   // Save HardID
retcode = Rockey(RY_OPEN, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
if (retcode)   // Error
    {
      printf("Error Code: %d\n", retcode);
```

```
        return;
      }
}
printf("\n");

rynum = i;

// Do our work
for (i=0;i<rynum;i++)
{

printf("Rockey %08X module status: ", HID[i]);
for (j=0;j<16;j++)
{
p1 = j;            // Module No
retcode = Rockey(RY_CHECK_MOUDLE, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
if (retcode)     // Error
{
printf("Error Code: %d\n", retcode);
return;
}
if (p2) printf("O");
else printf("X");
}
printf("\n");
}

// Close all opened Rockey

for (i=0;i<rynum;i++)
{
retcode = Rockey(RY_CLOSE, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
if (retcode)
{
printf("Error Code: %d\n", retcode);
return;
}

}



}
```

The above program searches all dongles with the same passwords attached to the computer and displays the status of every module in every listed dongle. "O" means that the module may be used and is not zero; "X" means

that the module cannot be used. In a protection scheme that relies on ROCKEY4ND modules this program would help the developer identify modules that are usable from ones that should be terminated.

7.5.5 The same code dongle advanced applications

If you have several software products but only a single purchase code – meaning that the passwords are all the same – you may use the solution indicated below to differentiate the dongles.

In **Step 22** the UDZ is used to distinguish the dongles with the same passwords. For example, the dongles with UDZ content of "Ver 10"correspond to software A.

```
#include <windows.h>

#include <stdio.h>
#include <conio.h>
#include "Rockey4_ND_32.h"

void ShowERR(WORD retcode)
{
	if (retcode == 0) return;
	printf("Error Code: %d\n", retcode);
}

void main()
{
	WORD handle[16], p1, p2, p3, p4, retcode;
	WORD handleEnd;

	DWORD lp1, lp2;
	BYTE buffer[1024];

	int i, j;

	p1 = 0xc44c;
	p2 = 0xc8f8;
	p3 = 0x0799;
	p4 = 0xc43b;

	{
	retcode = Rockey(RY_FIND, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);

	if (retcode)
	{
		ShowERR(retcode);
		return;
	}
	printf("Find Rock: %08X\n", lp1);
```

```
retcode = Rockey(RY_OPEN, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
if (retcode)

{

	ShowERR(retcode);
	return;
}

i = 1;
while (retcode == 0)
{
	retcode = Rockey(RY_FIND_NEXT, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode == ERR_NOMORE) break;
	if (retcode)
	{
		ShowERR(retcode);
		return;
	}

	retcode = Rockey(RY_OPEN, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)

	{
		ShowERR(retcode);
		return;
	}

	i++;
	printf("Find Rock: %08X\n", lp1);
}
printf("\n");


for (j=0;j<i;j++)
{
	/*p1 = 0;

	p2 = 5;
	  p3 = 1;
	strcpy((char*)buffer, "Ver10");
	retcode = Rockey(RY_WRITE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)
```

```
        {
            ShowERR(retcode);
            return;
        }
        printf("Write:%s\n",buffer);

        */
        p1 = 0;
        p2 = 5;

        memset(buffer, 0, 64);
        retcode = Rockey(RY_READ, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Read: %s\n", buffer);

        if (!strcmp(buffer,"Ver10"))
        {
            handleEnd=handle[j];
            break;
        }

    }

    {   //=========A==========
        retcode = Rockey(RY_RANDOM, &handleEnd, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Random: %04X\n", p1);


        lp2 = 0x12345678;
        retcode = Rockey(RY_SEED, &handleEnd, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
```

```
            printf("Seed: %04X %04X %04X %04X\n", p1, p2, p3, p4);


            retcode = Rockey(RY_CLOSE, &handleEnd, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
            if (retcode)
            {

                ShowERR(retcode);
                return;
            }

            printf("\n");

            }
        }

        }
```

In **Step 23** the UID is used to distinguish the dongles with the same passwords. For example, dongles with UID of "11111111" (hexadecimal) correspond to software A.

```
#include <windows.h>

#include <stdio.h>
#include <conio.h>
#include "Rockey4_ND_32.h"

void ShowERR(WORD retcode)
{
    if (retcode == 0) return;
    printf("Error Code: %d\n", retcode);
}

void main()
{
    WORD handle[16], p1, p2, p3, p4, retcode;
    WORD handleEnd;
    DWORD lp1, lp2;
    BYTE buffer[1024];

    int i, j;

    p1 = 0xc44c;
    p2 = 0xc8f8;
    p3 = 0x0799;
    p4 = 0xc43b;
```

```
{

retcode = Rockey(RY_FIND, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
if (retcode)
{
	ShowERR(retcode);
	return;
}
printf("Find Rock: %08X\n", lp1);

retcode = Rockey(RY_OPEN, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
if (retcode)
{
	ShowERR(retcode);
	return;
}


i = 1;
while (retcode == 0)
{
	retcode = Rockey(RY_FIND_NEXT, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode == ERR_NOMORE) break;
	if (retcode)
	{
		ShowERR(retcode);

		return;
	}

	retcode = Rockey(RY_OPEN, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
	if (retcode)
	{
		ShowERR(retcode);
		return;
	}

	i++;
	printf("Find Rock: %08X\n", lp1);
}
printf("\n");
```

```
    for (j=0;j<i;j++)
    {

        /*lp1= 0x11111111;
        retcode = Rockey(RY_WRITE_USERID, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Write User ID: %08X\n", lp1);
        */

        lp1 = 0;
        retcode = Rockey(RY_READ_USERID, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {

            ShowERR(retcode);
            return;
        }
        if(lp1==0x11111111)
        {
            handleEnd=handle[j];
            break;
        }

    }


    {       //=======A=============
p1 = 0;
        p2 = 12;
          p3 = 1;
        strcpy((char*)buffer, "Hello Feitian!");
        retcode = Rockey(RY_WRITE, &handleEnd, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Write: %s\n",buffer);

        p1 = 0;
```

```
            p2 = 12;

            buffer[512]=0;
            retcode = Rockey(RY_READ, &handleEnd, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
            if (retcode)
            {
                  ShowERR(retcode);
                  return;
            }
            printf("Read: %s\n",buffer);

            retcode = Rockey(RY_RANDOM, &handleEnd, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
            if (retcode)
            {
                  ShowERR(retcode);
                  return;
            }
            printf("Random: %04X\n", p1);

            lp2 = 0x12345678;
            retcode = Rockey(RY_SEED, &handleEnd, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
            if (retcode)
            {
                  ShowERR(retcode);
                  return;
            }
            printf("Seed: %04X %04X %04X %04X\n", p1, p2, p3, p4);

            retcode = Rockey(RY_CLOSE, &handleEnd, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
            if (retcode)
            {
                  ShowERR(retcode);
                  return;
            }

            printf("\n");

            }
      }


}
```

Chapter 8. ROCKEY4ND Hardware Algorithms

Developers may define their own algorithms and securely store them inside ROCKEY4ND. The dongle may then be used to calculate a result, and the result used by the application. Since the ROCKEY4ND's User Algorithm Zone (UAZ) is unreadable, even by the manufacturer, this type of software protection is potentially very powerful. Developers may use either the ROCKEY editor or the RY_WRITE_ARITHMETIC function to write algorithms to the dongle.

8.1 ROCKEY User Defined Algorithm Introduction

8.1.1 Instruction Format

All instructions must be in the following format:

reg1 = reg2 op reg3/value

reg1, *reg2* and *reg3* are registers. *value* is a figure. *op* is an operator.For example:

A = A + B

ROCKEY supports the following operators: +, -, <, *, ^,&, |, and ?.
value is a decimal number between 0 and 63.

Note: "?" operator is used for comparison.

For example, the results of "C = A ? B" are listed below:

C	A?B	B?A
A<B	0	FFFF
A=B	FFFF	FFFF
A>B	FFFF	0

It will write either "FFFF" or "0" to parameter *C* according to the table above.
First let us have a look at the algorithm example we will write to the dongle:

A= A+B, B = B + E, C = A * F, D = B + C, H = H ^ H

A, *B*, *C*… are registers in the dongle. There are a total of eight 16-bit registers in the dongle and they are designed: *A*, *B*, *C*, *D*, *E*, *F*, *G* and *H*.

8.1.2 Internal Algorithms & Application Interface

FEITIAN offers 3 calculation functions to call the user-defined algorithms:
RY_CALCULATE1, RY_CALCULATE2, and RY_CALCULATE3.
These three functions are structurally similar. Data is passed and received by way of the memory addresses *p1*, *p2*, *p3*, and *p4*.
When passing data to registers:

Register A = p1
Register B = p2
Register C = p3
Register D = p4

Register variables vary according to the calculation type: *Register E*, *Register F*, *Register G*, and *Register H*.
When receiving data from registers:

p1 = Register A
p2 = Register B
p3 = Register C
p4 = Register D

Registers A, *B*, *C* and *D* are user interface variables. *Registers E*, *F*, *G* and *H* are internal variables.

8.1.3 Differences between the Three Functions

p1, p2, p3 and p4 correspond to registers A, B, C and D in all three calculation functions. These registers are used nearly identically by the three calculation functions. The differences between the functions can be seen by reviewing the results written to registers E, F, G and H.
When a developer's ROCKEY4ND internal program is called, registers A, B, C and D will be populated with data from p1, p2, p3 and p4. The content of registers E, F, G and H will be initialized according to the calculation function in use. See below:

Internal Variable	RY_CALCULATE1
A	P1
B	P2
C	P3
D	P4
E	High 16 bits of hardware ID
F	Low 16 bits of hardware ID
G	Value stored in module *lp2
H	Random number

Internal Variable	RY_CALCULATE2
A	P1
B	P2
C	P3
D	P4
E	Seed return value 1 (depending on the seed code in *lp2)
F	Seed return value 2 (depending on the seed code in *lp2)
G	Seed return value 3 (depending on the seed code in *lp2)
H	Seed return value 4 (depending on the seed code in *lp2)

Internal Variable	RY_CALCULATE3
A	P1
B	P2
C	P3
D	P4
E	Content of the module specified by *lp2
F	Content of the module of *lp2 + 1
G	Content of the module of *lp2 + 2
H	Content of the module of *lp2 + 3

8.1.4 API Interface of the User's Applications

Below is the definition and description of the three calculation functions.

Function	RY_CALCULATE1 (Calculation 1)
Objective	Perform specified calculation
Input parameters	function = RY_CALCULATE1 *handle = Handle of the dongle *lp1 = Start point of calculation *lp2 = Module number *p1 = Input value 1 *p2 = Input value 2 *p3 = Input value 3 *p4 = Input value 4
Return value	A value of 0 indicates that the function works properly. Any other value indicates an error. When the function is executed successfully; *p1 = Return value 1 *p2 = Return value 2 *p3 = Return value 3 *p4 = Return value 4
Notes	For example, if the algorithm in the dongle is: A = B + C Then, the result by calling calculation 1 is: *p1 = *p2 + *p3 For example, if the algorithm in the dongle is: A = A + G

	If *p1 = 0 when inputting, then you may figure out the content of the module specified by *p1 = *lp2 when returning, although you cannot read the content of the module directly. If possible, you'd better verify the content of the module with an algorithm, instead of comparing in the program.

Function	RY_CALCULATE2 (Calculation 2)
Objective	Perform specified calculation
Input parameters	function = RY_CALCULATE2 *handle = Handle of the dongle *lp1 = Start point of calculation *lp2 = Seed code *p1 = Input value 1 *p2 = Input value 2 *p3 = Input value 3 *p4 = Input value 4
Return value	A value of 0 indicates that the function works properly. Any other value indicates an error. When the function is executed successfully; *p1 = Return value 1 *p2 = Return value 2 *p3 = Return value3 *p4 = Return value 4
Notes	When the dongle is calling the algorithm by calculation 2, the initial values of registers E, F, G, and H are the seed return value of *lp2. In other words, the dongle uses *lp2 as the seed code and calls RY_SEED function, and puts the return values into registers E, F, G, and H respectively for processing by the user.

Function	RY_CALCULATE3 (Calculation 3)
Objective	Perform specified calculation
Input parameters	function = RY_CALCULATE3 *handle = Handle of the dongle *lp1 = Start point of calculation *lp2 = Start address of module *p1 = Input value 1 *p2 = Input value 2 *p3 = Input value 3 *p4 = Input value 4

Return value	A value of 0 indicates that the function works properly. Any other value indicates an error. When the function is executed successfully; *p1 = Return value 1 *p2 = Return value 2 *p3 = Return value 3 *p4 = Return value 4
Notes	When the dongle is calling the algorithm by calculation 3, the initial values of registers E, F, G, and H are the contents of the successive 4 modules starting at *lp2. For example: the initial values of registers E, F, G, and H are as follows when calling calculation 3 with *lp2 = 0: E = Content of module 0 F = Content of module 1 G = Content of module 2 F = Content of module 3 **If the address of the module is greater than 63, the address will be wrapped. For example, when calling calculation 3 with *lp2 = 62, the initial values of registers E, F, G, and H are as follows:** E = Content of module 62 F = Content of modle 63 G = Content of module 0 H = Content of module 1

8.1.5 Writing Self-defined Algorithms to Dongle

8.1.5.1 Writing Algorithms

Aside from the use of ROCKEY4ND Editor, developers can also use the interface RY_WRITE_ARITHMETIC to develop a program for writing algorithms themselves.

Function	RY_WRITE_ARITHMETIC (Write algorithm)
Objective	Write algorithms as defined by developers
Input parameters	function = RY_WRITE_ARITHMETIC *handle = Handle of the dongle *p1 = Start point of the calculation *buffer= String of algorithm instructions
Return value	A value of 0 indicates that the function works properly. Any other value indicates an error.

For example:

```
strcpy(buffer , "A=A+E , A=A+F , A=A+G , A=A+H");
p1 = 3;
retcode= Rockey(RY_WRITE_ARITHMETIC , handle , &lp1 , &lp2 , &p1 , &p2 , &p3 , &p4 , buffer);
```

You can see that the algorithm to be written is placed into *buffer* and the instructions are separated by commas. The first instruction will be set to the start of the algorithm and the last instruction will be set to the end of the algorithm automatically. For example:

Address 3 of algorithm area: A=A+E

Address 4 of algorithm area: A=A+F

Address 5 of algorithm area: A=A+G

Address 6 of algorithm area: A=A+H

"3" is the start point of the algorithm in the dongle; and "6" is the end point of the algorithm in the dongle. After executing the instruction at address 6, the program will go to the user part. The calling of the program in the dongle must begin from the start point of the algorithm. If the calling point is not the start point of the algorithm, 4 random numbers will be returned.

8.1.5.2 Restrictions on Algorithm Instruction

There are some restrictions on algorithm instruction. They are described below with some example instructions:

A = A + B	Valid instruction
D = D ^ D	Valid instruction
A = B	Invalid instruction, must be in the format of algorithm, such as A = B | B
A = 0	Invalid instruction, must be in the format of algorithm, such as A = A ^ A
C = 3 * B	Invalid instruction, the constant must be postfixed, for example, C = B * 3
D = 3 + 4	Invalid instruction, only 1 constant is allowed in an instruction
A = A / B	Invalid instruction, the division operater is not supported
H = E*200	Invalid instruction, the constant must be lower than 64
A = A*63	Valid or invalid instruction, constants are not allowed in the first and last instructions

8.2 User Defined Algorithm Examples

8.2.1 Basic Algorithm Application Examples

8.2.1.1 Calculation 1 example

First we write the algorithm (We only need to write the algorithm once. The code used to write the algorithm(s) to the dongle does not appear in the application delivered to the end user.)

```
p1 = 0;strcpy(buffer, "H=H^H, A=A*23, F=B*17, A=A+F, A=A+G, A=A<C, A=A^D, B=B^B, C=C^C,D=D^D"); retcode = Rockey(RY_WRITE_ARITHMETIC, handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
```

Then call the following algorithm from the program:

```
lp1 = 0; // Start point of calculation
```

```
lp2 = 7; // Module number
p1 = 5; // Initial value of A
p2 = 3; // Initial value of B
p3 = 1; // Initial value of C
p4 = 0xffff; // Initial value of D
retcode = Rockey(RY_CALCULATE1, handle, &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
```

The command begins to execute from instruction 0 (lp1) of the UAZ and the registers are initialized as follows:

A = 5 (p1)

B = 3 (p2)

C = 1 (p3)

D = 0xffff (p4)

E = the upper 16-bit of HID

F = the lower 16-bit of HID

G = the value in module #7 (lp2)

H = random number (16-bit)

Assuming that the value in module 7 is 0x2121, the result of this calculation will be:

*((5*23 + 3*17 + 0x2121) < 1) ^ 0xffff = 0xbc71*

Calculation 1 example codes – **Step 24**:

```
#include <windows.h>

#include <stdio.h>
#include <conio.h>
#include "Rockey4_ND_32.h"

void ShowERR(WORD retcode)
{
    if (retcode == 0) return;
    printf("Error Code: %d\n", retcode);
}

void main()
{
    WORD handle[16], p1, p2, p3, p4, retcode;
    DWORD lp1, lp2;
    BYTE buffer[1024];


    int i, j;

    char cmd[] = "H=H^H, A=A*23, F=B*17, A=A+F, A=A+G, A=A<C, A=A^D, B=B^B, C=C^C, D=D^D";
    p1 = 0xc44c;
    p2 = 0xc8f8;
```

```
    p3 = 0x0799;
    p4 = 0xc43b;

    retcode = Rockey(RY_FIND, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)
    {
        ShowERR(retcode);
        return;
    }
    printf("Find Rock: %08X\n", lp1);


    retcode = Rockey(RY_OPEN, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)
    {
        ShowERR(retcode);
        return;
    }

    i = 1;
    while (retcode == 0)
    {
        retcode = Rockey(RY_FIND_NEXT, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode == ERR_NOMORE) break;
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }

        retcode = Rockey(RY_OPEN, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)

        {

            ShowERR(retcode);
            return;

        }

        i++;

        printf("Find Rock: %08X\n", lp1);
```

```
    }
    printf("\n");


    for (j=0;j<i;j++)
    {
        /*
        p1 = 7;
        p2 = 0x2121;
        p3 = 0;
        retcode = Rockey(RY_SET_MOUDLE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Set Moudle 7: Pass = %04X Decrease no allow\n", p2);
        printf("\n");
        */

        p1 = 0;
        strcpy((char*)buffer, cmd);
        retcode = Rockey(RY_WRITE_ARITHMETIC, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Write Arithmetic 1\n");


        lp1 = 0;
        lp2 = 7;

        p1 = 5;
        p2 = 3;

        p3 = 1;
        p4 = 0xffff;
        retcode = Rockey(RY_CALCULATE1, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
```

```
        {
            ShowERR(retcode);
            return;
        }
        printf("Calculate Input: p1=5, p2=3, p3=1, p4=0xffff\n");

        printf("\n");
        printf("Result = ((5*23 + 3*17 + 0x2121) < 1) ^ 0xffff = 0xBC71\n");
        printf("Calculate Output: p1=%x, p2=%x, p3=%x, p4=%x\n", p1, p2, p3, p4);


        retcode = Rockey(RY_CLOSE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }

        printf("\n");
        getch();
    }


}
```

8.2.1.2 Calculation 2 example

In **Step 25** we write algorithm ("A=A+B, A=A+C, A=A+D, A=A+E, A=A+F, A=A+G, A=A+H") to the UAZ, and the calculation result is 0x7b17.

```
#include <windows.h>

#include <stdio.h>
#include <conio.h>
#include "Rockey4_ND_32.h"

void ShowERR(WORD retcode)
{
    if (retcode == 0) return;
    printf("Error Code: %d\n", retcode);
}

void main()
{
```

```
    WORD handle[16], p1, p2, p3, p4, retcode;
    DWORD lp1, lp2;
    BYTE buffer[1024];


    int i, j;

    char cmd1[] = "A=A+B, A=A+C, A=A+D, A=A+E, A=A+F, A=A+G, A=A+H";

    p1 = 0xc44c;
    p2 = 0xc8f8;
    p3 = 0x0799;
    p4 = 0xc43b;

    retcode = Rockey(RY_FIND, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)
    {
        ShowERR(retcode);
        return;
    }
    printf("Find Rock: %08X\n", lp1);


    retcode = Rockey(RY_OPEN, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)
    {
        ShowERR(retcode);
        return;
    }


    i = 1;
    while (retcode == 0)
    {
        retcode = Rockey(RY_FIND_NEXT, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode == ERR_NOMORE) break;
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }

        retcode = Rockey(RY_OPEN, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
```

```
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }

        i++;

        printf("Find Rock: %08X\n", lp1);
    }
    printf("\n");


    for (j=0;j<i;j++)
    {

        /*
        lp2 = 0x12345678;
        retcode = Rockey(RY_SEED, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Seed: %04X %04X %04X %04X\n", p1, p2, p3, p4);
        printf("\n");

        */

        p1 = 10;

        strcpy((char*)buffer, cmd1);
        retcode = Rockey(RY_WRITE_ARITHMETIC, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Write Arithmetic 2\n");

        lp1 = 10;
        lp2 = 0x12345678;
        p1 = 1;
```

```
        p2 = 2;
        p3 = 3;
        p4 = 4;
        retcode = Rockey(RY_CALCULATE2, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Calculate Input: p1=1, p2=2, p3=3, p4=4\n");

        printf("\n");
        printf("Result =d03a + 94d6 + 96a9 + 7f54 + 1 + 2 + 3 + 4=0x7b17\n");
        printf("Calculate Output: p1=%x, p2=%x, p3=%x, p4=%x\n", p1, p2, p3, p4);

        retcode = Rockey(RY_CLOSE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }

        printf("\n");
        getch();
    }


}
```

8.2.1.3 Calculation 3 example

In **Step 26** we write algorithm ("A=A+B, A=A+C, A=A+D, A=A+E, A=A+F, A=A+G, A=A+H") to UAZ, and the calculation result is 0x14.

```
#include <windows.h>

#include <stdio.h>
#include <conio.h>
#include "Rockey4_ND_32.h"

void ShowERR(WORD retcode)
{
    if (retcode == 0) return;
    printf("Error Code: %d\n", retcode);
```

```
}

void main()
{
    WORD handle[16], p1, p2, p3, p4, retcode;
    DWORD lp1, lp2;
    BYTE buffer[1024];


    int i, j;

    char cmd2[] = "A=A+B, A=A+C, A=A+D, A=A+E, A=A+F, A=A+G, A=A+H";

    p1 = 0xc44c;
    p2 = 0xc8f8;
    p3 = 0x0799;
    p4 = 0xc43b;

    retcode = Rockey(RY_FIND, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)
    {
        ShowERR(retcode);
        return;
    }
    printf("Find Rock: %08X\n", lp1);


    retcode = Rockey(RY_OPEN, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);

    if (retcode)

    {
        ShowERR(retcode);
        return;
    }

    i = 1;
    while (retcode == 0)
    {
        retcode = Rockey(RY_FIND_NEXT, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode == ERR_NOMORE) break;
        if (retcode)
        {
```

```
            ShowERR(retcode);
            return;
        }

        retcode = Rockey(RY_OPEN, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }

        i++;

        printf("Find Rock: %08X\n", lp1);
    }
    printf("\n");


    for (j=0;j<i;j++)
    {
        /*
        p1 = 0;
        p2 = 1;
        p3 = 0;
        retcode = Rockey(RY_SET_MOUDLE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {

            ShowERR(retcode);

            return;
        }
        printf("Set Moudle 0: Pass = %04X Decrease no allow\n", p2);


        p1 = 1;
        p2 = 2;
        p3 = 0;
        retcode = Rockey(RY_SET_MOUDLE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
```

```
            return;
        }
        printf("Set Moudle 1: Pass = %04X Decrease no allow\n", p2);

        p1 = 2;
        p2 = 3;
        p3 = 0;
        retcode = Rockey(RY_SET_MOUDLE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Set Moudle 2: Pass = %04X Decrease no allow\n", p2);

        p1 = 3;
        p2 = 4;
        p3 = 0;
        retcode = Rockey(RY_SET_MOUDLE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Set Moudle 3: Pass = %04X Decrease no allow\n", p2);
        printf("\n");

        */
        p1 = 17;
        strcpy((char*)buffer, cmd2);
        retcode = Rockey(RY_WRITE_ARITHMETIC, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Write Arithmetic 3\n");

        lp1 = 17;
        lp2 = 0;
        p1 = 1;
```

```
        p2 = 2;
        p3 = 3;
        p4 = 4;
        retcode = Rockey(RY_CALCULATE3, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Calculate Input: p1=1, p2=2, p3=3, p4=4\n");

        printf("\n");
        printf("Result = 1+2+3+4+1+2+3+4=0x14\n");
        printf("Calculate Output: p1=%x, p2=%x, p3=%x, p4=%x\n", p1, p2, p3, p4);

        retcode = Rockey(RY_CLOSE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }

        printf("\n");
        getch();

        }

    }
```

8.2.2 Complex Algorithm Application Examples

8.2.2.1 Complex example 1

In **Step 27** we first search the dongle and get its hardware ID. Then we use the calculation 1 function in the program to get the hardware ID again. Compare the two hardware IDs. If they are different the program will be terminated.

```
#include <windows.h>

#include <stdio.h>
#include <conio.h>
#include "Rockey4_ND_32.h"

void ShowERR(WORD retcode)
```

```
{
    if (retcode == 0) return;
    printf("Error Code: %d\n", retcode);
}

void main()
{
    WORD handle[16], p1, p2, p3, p4, retcode;
    DWORD findlp1,truelp1;

    DWORD lp1, lp2;
    BYTE buffer[1024];


    int i, j;

    char cmd[] = "A=E|E,B=F|F,C=G|G,D=H|H";


    p1 = 0xc44c;
    p2 = 0xc8f8;
    p3 = 0x0799;
    p4 = 0xc43b;

    retcode = Rockey(RY_FIND, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)
    {
        ShowERR(retcode);
        return;

    }
    printf("Find Rock: %08X\n", lp1);
    findlp1=lp1;

    retcode = Rockey(RY_OPEN, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)
    {
        ShowERR(retcode);
        return;
    }

    i = 1;
    while (retcode == 0)
    {
```

```
        retcode = Rockey(RY_FIND_NEXT, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode == ERR_NOMORE) break;
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }

        retcode = Rockey(RY_OPEN, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }

        i++;

        printf("Find Rock: %08X\n", lp1);
    }
    printf("\n");


    for (j=0;j<i;j++)
    {
       /*
        p1 = 7;
        p2 = 0x2121;
        p3 = 0;

        retcode = Rockey(RY_SET_MOUDLE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Set Moudle 7: Pass = %04X Decrease no allow\n", p2);
        p1 = 0;
        strcpy((char*)buffer, cmd);
        retcode = Rockey(RY_WRITE_ARITHMETIC, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
```

```
            ShowERR(retcode);
            return;
        }
        printf("Write Arithmetic 1\n");
       */

        lp1 = 0;
        lp2 = 7;
        p1 = 1;
        p2 = 2;
        p3 = 3;
        p4 = 4;
        retcode = Rockey(RY_CALCULATE1, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Calculate Input: p1=1, p2=2, p3=3, p4=4\n");
        printf("Calculate Output: p1=%x, p2=%x, p3=%x, p4=%x\n", p1, p2, p3, p4);


        printf("\n");
        printf("Moudle 7 : %x\n", p3);
        truelp1=MAKELONG(p2,p1);

        printf("truelp1 : %x\n",truelp1);
        if (findlp1==truelp1)

            printf("Hello FeiTian!\n");
        else
            break;


        retcode = Rockey(RY_CLOSE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }

        printf("\n");
        getch();
```

```
    }


}
```

8.2.2.2 Complex example 2

In **Step 28** we get the return codes of a seed code with the calculation 2 function. Then we compare these return codes with the return codes we get with the same seed code at the beginning of the program. If they are different the program will be terminated.

```
#include <windows.h>
#include <stdio.h>
#include <conio.h>
#include "Rockey4_ND_32.h"

void ShowERR(WORD retcode)
{
    if (retcode == 0) return;
    printf("Error Code: %d\n", retcode);
}

void main()
{
    WORD handle[16], p1, p2, p3, p4, retcode;
    DWORD lp1, lp2;
    BYTE buffer[1024];

    WORD rc[4];

    int i, j;

    char cmd1[] = "A=E|E,B=F|F,C=G|G,D=H|H";


    p1 = 0xc44c;
    p2 = 0xc8f8;
    p3 = 0x0799;
    p4 = 0xc43b;

    retcode = Rockey(RY_FIND, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)
    {
```

```
        ShowERR(retcode);
        return;
    }
    printf("Find Rock: %08X\n", lp1);


    retcode = Rockey(RY_OPEN, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)
    {
        ShowERR(retcode);
        return;
    }

    i = 1;
    while (retcode == 0)
    {
        retcode = Rockey(RY_FIND_NEXT, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode == ERR_NOMORE) break;
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }

        retcode = Rockey(RY_OPEN, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);

        if (retcode)

        {

            ShowERR(retcode);
            return;
        }

        i++;

        printf("Find Rock: %08X\n", lp1);
    }
    printf("\n");
    for (j=0;j<i;j++)
    {
```

```
        lp2 = 0x12345678;
        retcode = Rockey(RY_SEED, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Seed: %04X %04X %04X %04X\n", p1, p2, p3, p4);

        rc[0] = p1;
        rc[1] = p2;
        rc[2] = p3;
        rc[3] = p4;


        //  :


        p1 = 0;
        strcpy((char*)buffer, cmd1);
        retcode = Rockey(RY_WRITE_ARITHMETIC, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);

            return;
        }
        printf("Write Arithmetic 2\n");


        lp1 = 0;
        lp2 = 0x12345678;
        p1 = 1;
        p2 = 2;
        p3 = 3;
        p4 = 4;
        retcode = Rockey(RY_CALCULATE2, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
```

```
        printf("Calculate Input: p1=1, p2=2, p3=3, p4=4\n");
        printf("Calculate Output: p1=%x, p2=%x, p3=%x, p4=%x\n", p1, p2, p3, p4);


        printf("\n");
        if(rc[0]==p1 && rc[1]==p2 && rc[2]==p3 && rc[3]==p4)

            printf("Hello FeiTian!\n");
        else
            break;


        retcode = Rockey(RY_CLOSE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }

        printf("\n");
        getch();

        }

    }
```

8.2.2.3 Complex example 3

In **Step 29** we get the values stored in the 64 modules by using the calculation 3 function. Remember that the modules may not be read, even with the Advanced passwords. You may write some important data to the modules or perform some other operations.

```
#include <windows.h>

#include <stdio.h>
#include <conio.h>
#include "Rockey4_ND_32.h"

void ShowERR(WORD retcode)
{
    if (retcode == 0) return;
    printf("Error Code: %d\n", retcode);
}

void main()
```

```
{
    WORD handle[16], p1, p2, p3, p4, retcode;

    DWORD lp1, lp2;
    BYTE buffer[1024];


    int i, j;

    char cmd2[] = "A=E|E,B=F|F,C=G|G,D=H|H";


    p1 = 0xc44c;
    p2 = 0xc8f8;
    p3 = 0x0799;
    p4 = 0xc43b;


    retcode = Rockey(RY_FIND, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)
    {
        ShowERR(retcode);
        return;
    }
    printf("Find Rock: %08X\n", lp1);


    retcode = Rockey(RY_OPEN, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)
    {
        ShowERR(retcode);

        return;
    }


    i = 1;
    while (retcode == 0)
    {
        retcode = Rockey(RY_FIND_NEXT, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode == ERR_NOMORE) break;
        if (retcode)
        {
```

```
            ShowERR(retcode);
            return;
        }

        retcode = Rockey(RY_OPEN, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }

        i++;

        printf("Find Rock: %08X\n", lp1);
    }
    printf("\n");


    for (j=0;j<i;j++)
    {
        /*
        p1 = 0;
        p2 = 1;
        p3 = 0;
        retcode = Rockey(RY_SET_MOUDLE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);

        if (retcode)
        {
            ShowERR(retcode);
            return;

        }
        printf("Set Moudle 0: Pass = %04X Decrease no allow\n", p2);


        p1 = 1;
        p2 = 2;
        p3 = 0;
        retcode = Rockey(RY_SET_MOUDLE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
```

```
            return;
        }
        printf("Set Moudle 1: Pass = %04X Decrease no allow\n", p2);

        p1 = 2;
        p2 = 3;
        p3 = 0;
        retcode = Rockey(RY_SET_MOUDLE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Set Moudle 2: Pass = %04X Decrease no allow\n", p2);

        p1 = 3;
        p2 = 4;
        p3 = 0;
        retcode = Rockey(RY_SET_MOUDLE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }

        printf("Set Moudle 3: Pass = %04X Decrease no allow\n", p2);
                            //  :
        */


        p1 = 0;
        strcpy((char*)buffer, cmd2);
        retcode = Rockey(RY_WRITE_ARITHMETIC, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Write Arithmetic 3\n");
```

```
        lp1 = 0;
        lp2 = 0;
        p1 = 0;
        p2 = 0;
        p3 = 0;
        p4 = 0;
        retcode = Rockey(RY_CALCULATE3, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Calculate Input: p1=0, p2=0, p3=0, p4=0\n");


        printf("\n");
        printf("Moudle 0: %x\n",p1);
        printf("Moudle 1: %x\n",p2);
        printf("Moudle 2: %x\n",p3);
        printf("Moudle 3: %x\n",p4);


        retcode = Rockey(RY_CLOSE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {

            ShowERR(retcode);
            return;
        }


        printf("\n");
        getch();
        }
}
```

8.2.2.4 Complex example 4

In **Step 30** we use all the three calculation functions and we write 4 calculation sections to the ROCKEY dongle. The results of the three calculations are used for additional calculations. Of course you may let ROCKEY perform much more complex calculations according to your situation.

```
#include <windows.h>

#include <stdio.h>
#include <conio.h>
#include "Rockey4_ND_32.h"

void ShowERR(WORD retcode)
{
    if (retcode == 0) return;
    printf("Error Code: %d\n", retcode);
}

void main()
{
    WORD handle[16], p1, p2, p3, p4, retcode;
    DWORD lp1, lp2;
    BYTE buffer[1024];


    int i, j;
    int t1,t2,t3;

    char cmd[] = "H=H^H, A=A*23, F=B*17, A=A+F, A=A+G, A=A<C, A=A^D, B=B^B, C=C^C, D=D^D";
    char cmd1[] = "A=A+B, A=A+C, A=A+D, A=A+E, A=A+F, A=A+G, A=A+H";
    char cmd2[] = "A=A+B, A=A+C, A=A+D, A=A+E, A=A+F, A=A+G, A=A+H";
     char cmd3[] = "H=H^H,A=A|A, B=B|B, C=C|C,D=A+B,D=D+C";

    p1 = 0xc44c;
    p2 = 0xc8f8;


    p3 = 0x0799;
    p4 = 0xc43b;

    retcode = Rockey(RY_FIND, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
    if (retcode)
    {
        ShowERR(retcode);
        return;
    }
    printf("Find Rock: %08X\n", lp1);


    retcode = Rockey(RY_OPEN, &handle[0], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
```

```
    if (retcode)
    {
        ShowERR(retcode);
        return;
    }

    i = 1;
    while (retcode == 0)
    {
        retcode = Rockey(RY_FIND_NEXT, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode == ERR_NOMORE) break;
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }

        retcode = Rockey(RY_OPEN, &handle[i], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }

        i++;

        printf("Find Rock: %08X\n", lp1);

}

    printf("\n");

    for (j=0;j<i;j++)
    {
        p1 = 7;
        p2 = 0x2121;
        p3 = 0;
        retcode = Rockey(RY_SET_MOUDLE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
```

```
        }
        printf("Set Moudle 7: Pass = %04X Decrease no allow\n", p2);
        printf("\n");


        lp2 = 0x12345678;
        retcode = Rockey(RY_SEED, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Seed: %04X %04X %04X %04X\n", p1, p2, p3, p4);
        printf("\n");


        p1 = 0;
        p2 = 1;
        p3 = 0;
        retcode = Rockey(RY_SET_MOUDLE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Set Moudle 0: Pass = %04X Decrease no allow\n", p2);

        p1 = 1;
        p2 = 2;

        p3 = 0;
        retcode = Rockey(RY_SET_MOUDLE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Set Moudle 1: Pass = %04X Decrease no allow\n", p2);

    p1 = 2;
        p2 = 3;
        p3 = 0;
```

```
        retcode = Rockey(RY_SET_MOUDLE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Set Moudle 2: Pass = %04X Decrease no allow\n", p2);

        p1 = 3;
        p2 = 4;
        p3 = 0;
        retcode = Rockey(RY_SET_MOUDLE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Set Moudle 3: Pass = %04X Decrease no allow\n", p2);
        printf("\n");



        p1 = 0;
        strcpy((char*)buffer, cmd);
        retcode = Rockey(RY_WRITE_ARITHMETIC, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {

            ShowERR(retcode);
            return;
        }
        printf("Write Arithmetic 1\n");


        lp1 = 0;
        lp2 = 7;
        p1 = 5;
        p2 = 3;
        p3 = 1;
        p4 = 0xffff;
```

```
        retcode = Rockey(RY_CALCULATE1, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Calculate Input: p1=5, p2=3, p3=1, p4=0xffff\n");


        printf("Result = ((5*23 + 3*17 + 0x2121) < 1) ^ 0xffff = 0xBC71\n");
        printf("Calculate Output: p1=%x, p2=%x, p3=%x, p4=%x\n", p1, p2, p3, p4);
        t1=p1;


        p1 = 10;
        strcpy((char*)buffer, cmd1);
        retcode = Rockey(RY_WRITE_ARITHMETIC, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Write Arithmetic 2\n");


        lp1 = 10;
        lp2 = 0x12345678;
        p1 = 1;
        p2 = 2;

        p3 = 3;
        p4 = 4;
        retcode = Rockey(RY_CALCULATE2, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Calculate Input: p1=1, p2=2, p3=3, p4=4\n");
```

```
        printf("Result =d03a + 94d6 + 96a9 + 7f54 + 1 + 2 + 3 + 4=0x7b17\n");
        printf("Calculate Output: p1=%x, p2=%x, p3=%x, p4=%x\n", p1, p2, p3, p4);
        t2=p1;


        p1 = 17;
        strcpy((char*)buffer, cmd2);
        retcode = Rockey(RY_WRITE_ARITHMETIC, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Write Arithmetic 3\n");


        lp1 = 17;
        lp2 = 0;
        p1 = 1;
        p2 = 2;
        p3 = 3;
        p4 = 4;
        retcode = Rockey(RY_CALCULATE3, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }
        printf("Calculate Input: p1=1, p2=2, p3=3, p4=4\n");
        printf("Result = 1+2+3+4+1+2+3+4=0x14\n");
        printf("Calculate Output: p1=%x, p2=%x, p3=%x, p4=%x\n", p1, p2, p3, p4);
        t3=p1;

        printf("\n");
        p1 = 24;
        strcpy((char*)buffer, cmd3);
        retcode = Rockey(RY_WRITE_ARITHMETIC, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
```

```
        }
        printf("Write Arithmetic \n");

        lp1 = 24;
        lp2 = 7;
        p1 = t1;
        p2 = t2;
        p3 = t3;
        p4 = 0;
        retcode = Rockey(RY_CALCULATE1, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4,
buffer);
        if (retcode)
        {
            ShowERR(retcode);
            return;
        }

        printf("Calculate Output: p1=%x, p2=%x, p3=%x, p4=%x\n", p1, p2, p3, p4);

        retcode = Rockey(RY_CLOSE, &handle[j], &lp1, &lp2, &p1, &p2, &p3, &p4, buffer);
        if (retcode)
        {
            ShowERR(retcode);

            return;
        }
        printf("\n");
        getch();
    }

    }
```

8.2.3 Advanced Algorithm Application Examples

In **Step 31** we will write the core algorithms or codes of the application to the ROCKEY dongle. Below are three programs: the original program, the ROCKEY initializing program and the final program for the end users.
The original program:

```
#include "stdafx.h"

#include "DrawCircle.h"

#include "DrawCircleDoc.h"
#include "DrawCircleView.h"
#include "DrawParamDlg.h"
```

```
#include "DrawMethodDlg.h"

#ifdef _DEBUG
#define new DEBUG_NEW
#undef THIS_FILE
static char THIS_FILE[] = __FILE__;
#endif

void CDrawCircleView::DrawCircleMidPoint(CDC *pDC, int iCenterX, int iCenterY, int r)
{
    int x=0;
    int y=r;
    int p=1-r;

    TRACE("Origin\n");

    CirclePlotPoints(pDC,iCenterX,iCenterY,x,y);

    m_lpCircleBuf[0].x = x;
    m_lpCircleBuf[0].y = y;
    m_nPointCount=1;

    while(x<y)
    {
        x++;
        if(p<0)
        {
            p+=2*x+1;
        }
        else

        {
            y--;
            p+=2*(x-y)+1;
        }
        TRACE("%d,(%d,%d);",p,x,y);
        CirclePlotPoints(pDC,iCenterX,iCenterY,x,y);

        m_lpCircleBuf[m_nPointCount].x = x;
        m_lpCircleBuf[m_nPointCount].y = y;
        m_nPointCount++;
    }
    TRACE("\n");
```

```
    }
```

Initialize dongle:

```
#include "stdafx.h"

#include <windows.h>
#include "..\inc\Rockey4_ND_32.h"

void ReportErr(WORD wCode)
{
    printf("ERROR:%d\n",wCode);
}

int main(int argc, char* argv[])
{
    WORD  p1=0xc44c,p2=0xc8f8,p3=0x0799,p4=0xc43b;
    DWORD lp1,lp2;
    WORD  handle[16];
    BYTE  buffer[1024];
    BYTE  cmdstr[] = "B=B|B,B=B+1,B=B*2,B=B+1,A=A+B,C=C-1,C=C*2,B=A-C";
    WORD  retcode;

    retcode = Rockey(RY_FIND,&handle[0],&lp1,&lp2,&p1,&p2,&p3,&p4,buffer);
    if(retcode)
    {
        ReportErr(retcode);
        return 0;
    }


    printf("Find successfully\n");

    retcode = Rockey(RY_OPEN,&handle[0],&lp1,&lp2,&p1,&p2,&p3,&p4,buffer);
    if(retcode)
    {
        ReportErr(retcode);
        return 0;
    }
    printf("Open successfully\n");

    p1 = 10;
```

```
    retcode                                                                    =
Rockey(RY_WRITE_ARITHMETIC,&handle[0],&lp1,&lp2,&p1,&p2,&p3,&p4,cmdstr);
    if(retcode)
    {
        ReportErr(retcode);
        return 0;
    }
    printf("Write arithmetirc successfully\n");

    retcode = Rockey(RY_CLOSE,&handle[0],&lp1,&lp2,&p1,&p2,&p3,&p4,buffer);


        return 0;

    }
```

The final program for the end users:

```
#include "stdafx.h"
#include "DrawCircle.h"

#include "DrawCircleDoc.h"
#include "DrawCircleView.h"
#include "DrawParamDlg.h"
#include "DrawMethodDlg.h"

#ifdef _DEBUG
#define new DEBUG_NEW
#undef THIS_FILE
static char THIS_FILE[] = __FILE__;
#endif

WORD  p1=0xc44c,p2=0xc8f8,p3=0x0799,p4=0xc43b;
DWORD lp1,lp2;
WORD  handle[16];
BYTE  buffer[1024];

void CDrawCircleView::DrawCircleMidPoint_Rockey(CDC *pDC, int iCenterX, int iCenterY,
int r)
{
    int x=0;
    int y=r;
    int p=1-r;
```

```
    int seed=0;

    short p1,p2,p3,p4;

    CirclePlotPoints(pDC,iCenterX,iCenterY,x,y);

    TRACE("Hardware\n");
    m_lpCircleBuf[0].x = x;
    m_lpCircleBuf[0].y = y;
    m_nPointCount=1;

    while(x<y)
    {
        p1 = p;
        p2 = x;
        p3 = y;
        p4 = seed;

        if(!RunRockey((WORD&)p1,(WORD&)p2,(WORD&)p3,(WORD&)p4))
        {
        //  AfxMessageBox("Runtime error");
            break;
        }

        if(p<0)
        {
            p = p1;
        }
        else
        {
            p = p2;
            y--;

        }
        x++;
        TRACE("%d,(%d,%d);",p,x,y);
        CirclePlotPoints(pDC,iCenterX,iCenterY,x,y);

        m_lpCircleBuf[m_nPointCount].x = x;
        m_lpCircleBuf[m_nPointCount].y = y;
        m_nPointCount++;
    }
    TRACE("\n");
}
```

```
BOOL CDrawCircleView::RunRockey(WORD &A, WORD &B, WORD &C, WORD &D)
{
    WORD retcode;

    lp1 = 10;
    retcode = Rockey(RY_CALCULATE1,&handle[0],&lp1,&lp2,&A,&B,&C,&D,buffer);

    if(retcode)
        return FALSE;
    else
        return TRUE;

    }
```

Note: ROCKEY4ND has as many as 128 instructions. Developers do not need to consider the start and end attributes of an algorithm. ROCKEY will automatically assign a Start/End attribute to the instructions. In practice this means that if the developer writes a two-instruction algorithm to the User Algorithm Zone (UAZ), and then a three instruction algorithm, the result will not be a single five instruction algorithm. Algorithms that begin with "Null" or "E" will produce unpredictable results.

8.3 Tips

1. Make randomized calls to the ROCKEY API - Randomly scatter calls to the ROCKEY API from within your application. Calls made to the API from time-to-time will make it very difficult to mimic the behavior of the protection method or hack the application.

2. Use dynamic information with the seed code function -The use of dynamic information with the seed code function, such as system date, makes the protection method stronger because the results can change with the input and calculation.

3. Do not repeatedly use the same protection method in your application -If you use the same protection method several times in your application it will be easier for the cracker to find the rule and crack your application. Protection methods that are complex and rely on a number of different checks and calculations are the most difficult to crack.

4. Encrypt the character string and data – In "Step 18" of this document we showed an encryption method using information stored inside the dongle. Encrypting a character string in the manner described is a strong method because a failure to properly decrypt the string can cause the application to terminate or take other actions in accordance with the licensing agreement.

5. Use API encryption and Envelope encryption together – The strongest protection method will have the developer first using a complex and dynamic implementation of the ROCKEY API, and then protecting this new file with the ROCKEY Envelope.

Keep the end user environment in mind when you design the software protection solution. You should flexibly adopt the methods suggested here within the limitations and objectives of your environment and licensing policy.

Chapter 9. FAQs

Some frequently asked questions about ROCKEY4ND are listed in this chapter. You may find the solution to your problems with the use of the ROCKEY4ND dongle hereinafter.

9.1 Typical Solutions to Some Problems

- Test the dongle using Rockey4ND_editor under *Editor* directory.
- Replace the current version of the driver with the newest version, which can be downloaded from Feitian website. The website will be updated between whiles.
- Check if the problem persists after using another computer with your device.
- Check if your computer has been attacked by a virus or the like, which may block the program you are using.

9.2 FAQs

9.2.1 What is an evaluation kit?

The evaluation kit is designed for developers to evaluate the dongle product. It usually includes a package, documentation, a CD-ROM, and a dongle. The dongle is the same as the formal dongle, except that the access password for it is public. If customers want to purchase the product after evaluation, a dongle with a unique password will be provided for security consideration.

9.2.2 What is the order number?

The order number is a reference number for management purpose in fact. It does not associate with the passwords of the dongle directly.

9.2.3 Is it possible that others can buy a dongle as same as mine?

That is impossible. The passwords of the dongle of each customer are different. We keep the record of each customer. We can sign a security agreement with you if necessary. We will deliver the dongle to you as required.

9.2.4 Are the passwords of ROCKEY4ND dongle secure enough?

Yes, they are very secure. They include 4 passwords divided into 2 levels. Each is 16 bits in length. The 1st level includes 2 basic passwords for basic operations on the dongle. The 2nd-level passwords are dedicated advanced passwords provided to developers for controlling writing to the dongle and defining encryption algorithms. These

2 passwords must not appear in the software delivered to end users. If the advanced passwords are entered in error and the special memory has been written 4 times, the dongle will be locked for 2 seconds. No operations can be performed during the 2 seconds. This measure prevents attempts of the passwords by attackers.

9.2.5 What are same-numbered dongles?

The dongles have the same order number. In other words, they share the same passwords. Each copy of the software is delivered with a dongle to end users. Since all the delivered dongles have the same number, devopers do not need to re-compile each copy of the software.

9.2.6 What can I do if I forget the passwords of the dongle?

Use another dongle. Or, you must prove that you ordered that dongle before. For details, consult our post-sales.

9.2.7 Is it true that a data sharer can be used to share a dongle?

The data sharer can be prevented if you do as follows: generate a random number at the beginning of the program and store it at a fixed address in the memory of the dongle; and verify if the data at that address is equal to the random number at runtime of the program. If the program is also running on another computer, which works with the dongle, a different random number must have been written to that address.

9.2.8 Will it slow down the running of software to write a complex algorithm to the ROCKEY4ND dongle?

No. The difference between the time consumed by the simplest algorithm and the time consumed by the most compliex algorithm is merely several tens of milliseconds. If the complex algorithm is not invoked frequently, you cannot perceive the slowness.

9.2.9 What is the problem if my USB dongle is recognized as Unknown Device?

This problem occurs occasionally. Generally, your device is not attached properly to the computer, or some interference exists. Remove your dongle and try to attach it again.

9.2.10 Why can't I see the USB device in Device Manager when I use the dongle with a Windows 98 computer which has a USB port?

Maybe the USB supporting option is disabled in BIOS.

9.2.11 How can I update the software of the dongle?

If you are a testing user, you will be sent the last-minute updates. Otherwise, you can go to our website (http://www.FTsafe.com) to get the latest DK.

9.2.12 I was prompted "Rockey4ND.dll not found" when protecting FoxPro and VB programs by calling APIs. What is the problem?

Although Rockey4ND.dll is present under current directory, you must copy it to a system directory because FoxPro and VB programs find the dynamic-linking libraries only in system directory.

Appendix A: Contents of SDK Directory

Directory	Description
Setup.exe	Installer
Flielist.txt	List of files
Api32	32-bit APIs
Api64	64-bit APIs
Docs	User manual(s)
Driver For Win98	Driver for Windows 98 SE
Include	Header files
NetRockey	Network dongle DK
Samples	Sample programs
Utilities	Dongle Editor and Envelope Encryptor

Appendix B: Performance Comparison of Dongles

Feitian is always dedicated to provide products with high stability, integrity, and quality, and make continuous improvements. Developers can get free trial offerings from us. You are appreciated if you can complete the following form and send it to us.

Performance Comparison of Dongles				
Items for comparison	ROCKEY4ND	Competing Product		
		Y	N	?
USB interface device	√			
Operating voltage as low as 2.2v	√			
Passwords and ID number burned into CPU, even manufacturer cannot change them	√			
Memory read/write unit	√			
Unique hardware ID for each dongle	√			
Able to work in parallel with dongles of the same or different kind without any problems	√			
Able to work in series for same-numbered dongles	√			
Good adaptability, works normally even when a printer is connected	√			
No conflicts even when printing	√			
Support for direct envelope encryption for executable files, without the need of source code of the software	√			
Able to prevent the track and crack by debugging tools	√			
Customizable onboard algorithms	√			
Encrypted software can word under Windows 98 SE/2000/XP/2003	√			
2-level password control, developer passwords do not appear in user software	√			
Mass storage CPU program memory	√			
1000 bytes or more user memory	√			
Onboard time gate preventing track by software	√			
Able to encrypt a set of software programs/ modules	√			